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ENTOMOLOGY.—*The genetics laboratory mite* Histiostoma laboratorium, *n.sp.* (*Anoetidae*).[1]

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(Communicated by ROBERT C. COOK.)

For years mites that thrive on *Drosophila* culture media, such as banana-agar or cornmeal-molasses-agar, have been serious pests in genetics laboratories. Of the several known forms that can successfully be cultured on these media, at least two families and several genera are represented. On the basis of observations made to date, however, the form described below is believed to be by far the commonest pest. That this is so is readily understood when we consider that this species has a short life cycle and a very effective migratory phase. The hypopus is resistant to desiccation, can crawl long distances in the laboratory, and can be dispersed over greater areas by becoming attached by suckers to *Drosophila* and other insects.

Although this species has been observed innumerable times, it appears not to have been previously described. The possible exception is Stanley G. Stolpe's description of *Histiostoma genetica* (*The life cycle of the tyroglyphid mites infesting cultures of* Drosophila melanogaster. Anat. Rec. **72**: (Suppl.: 133–134. 1938).His paper contains no illustrations and is so lacking in pertinent details that it is impossible to use it as a basis for establishing a new species. Studies are now in progress on the biology and cytogenetics of this new species and related forms.

Acknowledgments.—My thanks are due to Miss Dorothy Booth for her assistance in preparation of the finished drawings, to Dr. H. H. J. Nesbitt for his kindness in reading the manuscript, and especially to Miss Caroline O. Goode for her generous assistance in all phases of this study.

[1] Received March 20, 1950.

Histiostoma laboratorium, n. sp.

Female (Figs. 1, 2, 5).—Average length of adult gravid females 0.46 mm, average width 0.31 mm. Gravid females over six days old from uncrowded cultures varied considerably in length and width. Length varied from 0.40 mm to 0.51 mm; width from 0.26 mm to 0.39 mm. Measurements refer to total length and width of body including gnathosoma but are exclusive of legs and setae extending beyond the body margins. Color of body whitish, semitransparent, and finely granular. The body of gravid females is rotund with sides gradually tapering anteriorly; nongravid females with sides of body more or less parallel. On the ventral surface the ring or sole-shaped structures characteristic of the family Anoetidae are conspicuous. The anterior pair is more or less sole-shaped and is located anteriad and slightly mesiad of trochanter III. The posterior pair is triangular to ring-shaped and lies in a position more mesiad than the anterior pair and on a line connecting trochanters IV. The anal slit is also conspicuous and lies in a median position somewhat near the posterior tip of the body. The vulva, very difficult to see, is a wide, transverse opening, slightly convex on the anterior edge, with the lateral margins almost in contact with the sole-shaped structures. The anterior lip is marked by a slight thickening of chitin. Two small chitinous processes from this lip seem to project posteriorly into the orifice, which can most easily be demonstrated by probing with a fine needle. The ventral body surface bears six pairs of very small setae located as follows: first pair, slightly above a line connecting trochanters II, median in position; second pair, slightly posteriad of the lateral margins of vulva; third pair, on a line connecting trochanters III and directly beneath the anterior sole-shaped structures; fourth pair, beneath and slightly lat-

erad of the posterior pair of ring-shaped structures; fifth pair, close to the anterior end of the anal slit; sixth pair, slightly below the posterior end of anal slit and more lateral than the fifth pair. All these setae are very fine but spinelike. The second and sixth pairs are hardly more than minute bristles and consequently seen with difficulty. In addition to these small setae there is a pair of posterior ventral submarginal setae, which are similar to the typical setae on the dorsal surface but somewhat shorter and thinner at the base. Also there is a pair of long anterior submarginal setae between legs II and III. Since the body is semitransparent the large eggs are easily seen. Fig. 1 shows a female with three eggs. As many as five or more well-formed eggs can be dissected from a fully gravid female. Ventrally the coxae together with the apodemata form conspicuous, ramifying structures but only their main outlines are shown in Fig. 1.

Dorsally an almost invisible sulcus posteriad of legs II can be seen. In the anterior or cervical region of the propodosoma faintly visible sclerotic thickenings form a characteristic mosaic pattern. In the posterior portion of the propodosoma a different type of pattern, consisting of rectanglelike structures with the long axes parallel to the main axis of the body, is sometimes but more faintly seen than the mosaic pattern in the anterior region. Neither of these sclerotic patterns is shown in Fig. 2. Presumably together they form the so-called propodosomal shield frequently visible on other species. A pair of well-defined excretory organs lie in a lateral position posteriad of legs IV. The small excretory pore is found on a slight elevation, beneath which a rather large transparent colorless vesicle may be seen. On a level with the excretory organs and in the midline, the small but distinct poer of the bursa copulatrix is visible. Eight setae are found dorsally on the propodosoma: a pair of minute bristlelike rostral setae at the anterolateral corners, sometimes apparently overhanging the margin; a small pair of cervical setae; an inner and outer pair of propodosomatic setae, which are long and tapering. On the hysterosoma are five pairs of more or less median setae: first pair, just posteriad of the sulcus; second pair, one on each side of the bursa copulatrix; third, fourth, and fifth pairs placed progressively more posteriad with the fifth, or most posterior pair, marginal in position. There are six lateral setae on each side of the dorsum: two very close together in the humeral position and on same level with the ventral anterior submarginal seta; one slightly posteriad of leg III; one laterad of the excretory organ; one behind preceding; and one posterior marginal seta. Except for the three median pairs of setae on the propodosoma, the relative sizes of which are shown in Fig. 2, all the dorsal setae are approximately of the same length. These setae appear very much like the lighted end of a candle. They arise from short cylindrical protuberances, have narrow bases, which increase in diameter in the proximal portion of the setae, and taper abruptly to long fine points.

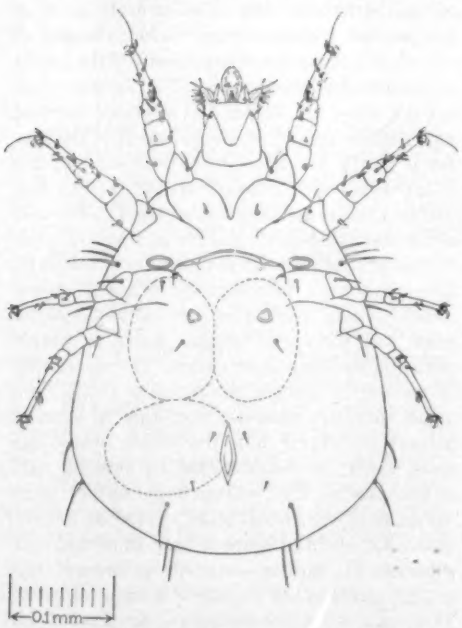

FIG. 1.—*Histiostoma laboratorium*, n.sp.: Adult female, ventral view.

Because of its size, compactness, and complexity the gnathosoma is difficult to interpret. The details appear to be as follows: Dorsally the propodosoma overhangs the gnathosoma obscuring about one-third of it. The chelicerae are delicate structures, wide at the base, and tapering anteriorly. Each structure bears numerous teeth on its mesial side and terminates in a fine bristle with a minute knob, which is probably sensory in function. A few hairlike setae are found in a medial position possibly attached to the basal portion of chelicerae. The

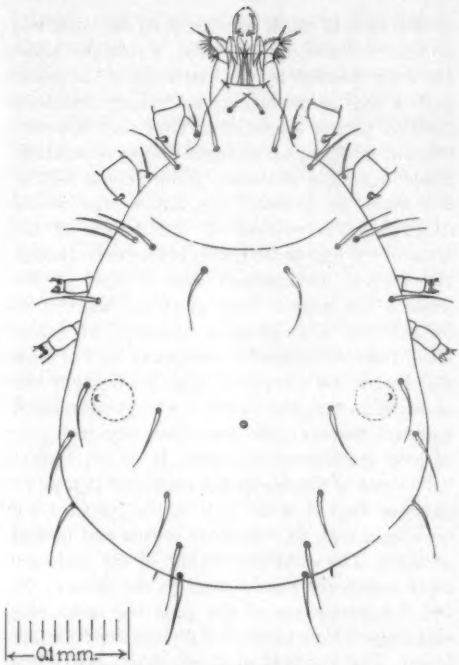

FIG. 2.—*Histiostoma laboratorium*, n.sp.: Adult female, dorsal view.

chelicerae are rapidly extended and retracted, apparently with a "raking" action, while the animal is feeding. The pedipalps appear to have three segments with indistinct lines of separation. Segment 1 bears one prominent spinelike seta. Another distinct but smaller seta can be seen slightly posteriad of this seta, arising either from the same pedipalpal segment or from a closely associated structure. Segment 2 bears one small seta. The basal segment is without setae, unless what appears to be a labial seta (Fig. 1) is actually a seta taking its origin from the base of the pedipalp. Mesially a pair of rather prominent pointed processes are found partially surrounding the chelicerae. Presumably these structures arise from the bases of the pedipalps. Extending from the pedipalps laterally are many extremely fine hairs, which apparently do not arise directly from the pedipalpal segments but from a thin membrane associated with it. Dorsally and mesially of pair of lacinialike structures are seen to be associated with the pedipalps.

Legs I and II are typically directed anteriorly and legs III and IV posteriorly. Locomotion is accomplished by a pulling action by I and II and a pushing action by III and IV. Legs I and II are approximately of equal length and are broader and much more robust than legs III and IV. The arrangement and type of setae and other structures of all the legs of the female are shown in Fig. 1. All setae are shown in this figure as taking their origin from the mesial sides of the legs. Fig. 5 is an enlarged view of leg I showing the setae in their true relationships. The setae, or portions of setae, lying on the lateral side are shown in broken lines.

It will be noted that only legs I and II have the very long hairlike setae at the tip of the tarsus. Otherwise the general arrangement and size of the claws, rudimentary caruncles, and setae at the distal end of the tarsus are the same for all legs. However, tarsus I has one large extra spine distally not found on other tarsi. In addition to these spines and spinules tarsus I has five other spines, tarsus II four other spines, and tarsi III and IV three other spines. Tarsus II also has a conspicuous striated macrosense organ at its proximal end. Tibiae I and II have three spines, and tibiae III and IV only two spines. In addition, tibia I has a macrosense organ of the same size and structure as found on the proximal end of tarsus II. Arising from the same base as this macrosense organ is found a rather

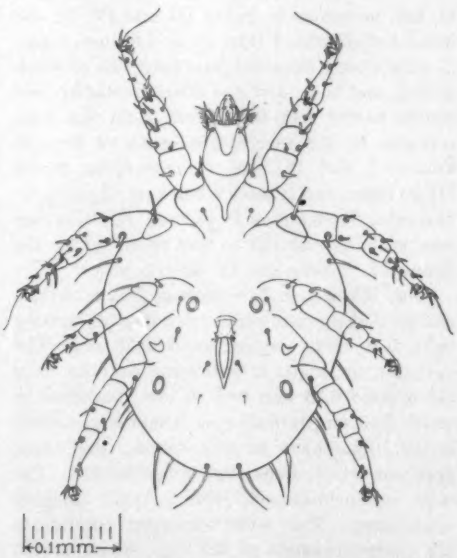

FIG. 3.—*Histiostoma laboratorium*, n.sp.: Adult male, ventral view.

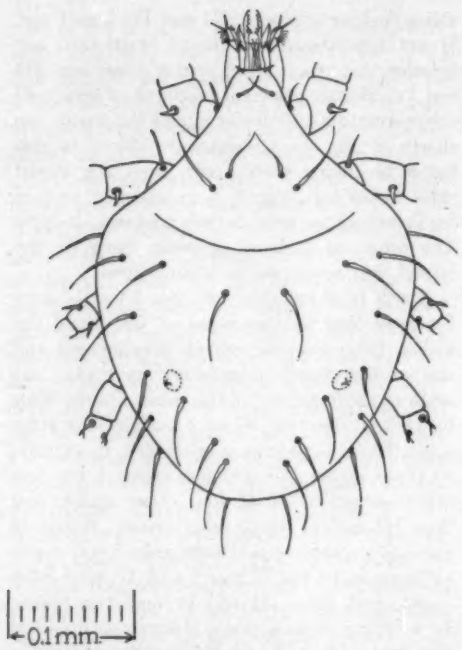

FIG. 4.—*Histiostoma laboratorium*, n.sp.: Adult male, dorsal view.

peculiar long bristle with a rounded tip. There are two spines of typical shape on genua I and II, and no spines on genua III and IV. On the distal end of genu I there is, in addition, a pair of setae arising from the same base; one of which is long and thin, and the other bristlelike and similar to the seta that arises from the base common to the macrosense organ of tibia I. Femora I and II have a single spine, femur III no setae, and femur IV one long almost hairlike seta. Trochanters I, II, and III have one seta, each very similar to that described for the femur IV. Trochanter IV has no seta.

Male (Figs. 3, 4, 5).—Average length of male exclusive of legs and setae extending beyond the body 0.38 mm; average width 0.23 mm. The variation in length of specimens over six days old is from 0.33 mm to 0.40 mm; variation in width 0.17 mm to 0.25 mm. There is a marked sexual dimorphism in this species, this being apparent even under low magnification. The male is shield-shaped, with a small tapering opisthosoma. This latter character emphasizes the conspicuousness of the legs, which are in fact more robust than those of the female, especially legs III and IV, even though the body of the male is much smaller. Also the male can be easily distinguished from a female under low magnification by the extension of his fourth pair of legs posteriorly in a virtually immobile position during locomotion. They are, however, efficient grasping appendages during copulation. Aside from the obviously more robust legs of the male, as pointed out above, the sexual dimorphism is evident in the details of the setae of the legs as well. This is true even though the general arrangement and number of the setae is the same in both sexes and there is no difficulty in establishing homologies. An example of these differences is seen when leg I of male and female are compared (Fig. 5). Dorsally the male differs from the female in a most unexpected manner, namely, the male has one less pair of long opisthosomatic setae. It is not certain which pair is missing in the male, but it may be assumed that it is the pair in the female lying on a level with the excretory organs and mesiad of them. The excretory organs of the male are more anteriorly placed than in the female. On the ventral surface of the male the same four ring-shaped structures of unknown function are found. The position of these structures differs considerably from those in the female. The anterior pair is ring-shaped in contrast to the sole-shape condition in the female and slightly posterior to trochanter III. This pair is also more mesiad. The posterior pair is much more laterad than in the female and posteriad of trochanter IV. The anal slit of the male also contrasts with position of the anal slit in the female. In the male it lies on the same level as trochanter IV, whereas in the female it is more posteriad. The number of small spinelike setae on the ventral surface of the male is the same as in the female. The arrangement of these setae appears to be quite different in the male and female at first glance. The pattern for the male is as follows: one pair slightly above a line between trochanters II, one pair on a level with trochanters III, one pair just laterad to the anterior ring-shaped structures, one pair more or less on a level with trochanters IV, and two pairs near the posterior part of the anus. The most posterior pair of anal setae are extremely small and difficult to see. Aside from the genital apparatus, the ventral surface of the male differs from the female in another feature. Near and slightly mesiad of trochanters IV an obscure boss, or elevation is found. It does not appear

to be a part of the apodemata in this region. The male genital opening is at the anterior end of the anal slit. It has two pairs of spinules at its posterior margin. On several occasions a very minute erectile structure in this region has been seen. This structure is presumed to be a penis. Normally it appears to be retracted into a groove in the anterior end of the anal slit, although the above structures are not entirely clear. During copulation the male mounts the female dorsally in such an attitude that the genital apparatus is in juxtaposition with the bursa copulatrix of the female. All other features of the male not described above, such as the gnathosoma, are essentially the same as in the female.

Hypopus (Figs. 5, 6, 7).—Average length exclusive of legs 0.18 mm; width 0.14 mm. Variation in length from 0.16 mm to 0.20 mm; width 0.12 mm to 0.16 mm. Color light to dark amber. The hypopus is apparently mouthless, the gnathosoma being represented chiefly by a pair of antennalike setae, which arise from a common base. The legs are extremely long for the size of the body, enabling the hypopus to crawl rapidly over the culture medium or other surfaces. The hypopus is very resistant to desiccation and is not harmed after long periods in a completely liquid medium.

The most prominent structure ventrally is the suctorial plate. Eight conspicuous discs are seen in this plate; an anterior pair of medium

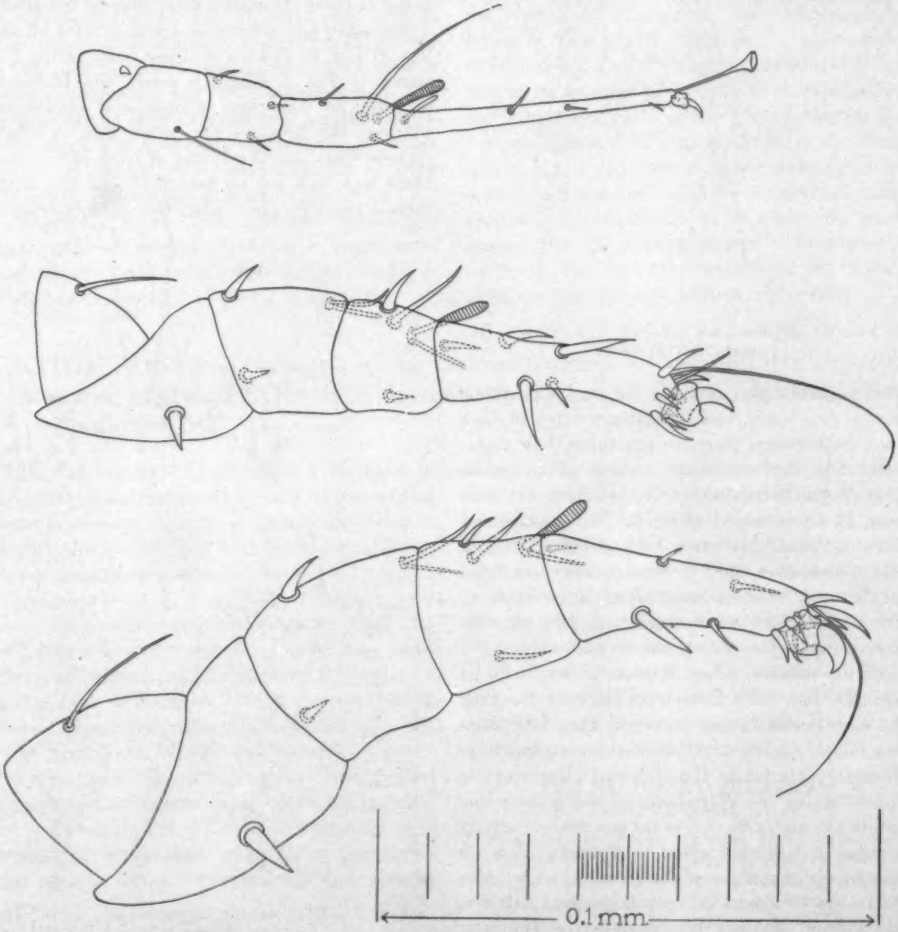

FIG. 5.—*Histiostoma laboratorium*, n. sp.: Legs I, hypopus (upper figure), adult female (middle), adult male (lower).

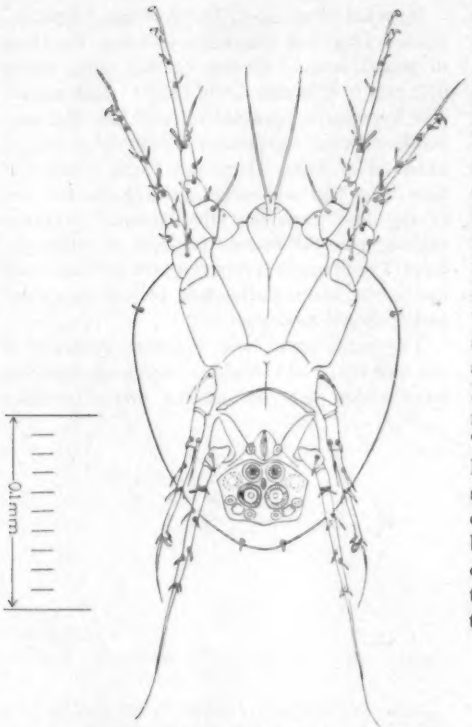

FIG. 6.—*Histiostoma laboratorium*, n.sp.: Hypopus, ventral view.

size, a middle pair of large size, and a posterior row of four small ones. The anterior pair of discs may be extended three or four times their diameters and are obviously suckers. The middle pair appear to be suckers also but have not been seen in an extended position. The structure of the four small posterior discs is different from the above discs, and it appears very doubtful if they can function as suckers. In addition to the above eight discs there is a pair of very faint ringlike structures, one on each side of the anterior suckers. They appear to be incipient suckers, but there is no real evidence for this. In each posterolateral corner of the plate there is a faintly visible structure of unknown function. Directly anterior to the suctorial plate there is a slit having the appearance of the anus in the adult. On each side of this slit is a disc somewhat similar in size and shape to the four discs on the posterior margin of the suctorial plate. Also there are two pairs of very faint rings between the slit and the discs mentioned above. Ventrally two pairs of minute submarginal setae are observed. One pair is anterolaterad, and one pair at the posterior end. The coxae and apodemata are outlined in the ventral view of the hypopus (Fig. 6). Dorsally a distinct sulcus is present. The propodosoma has one row of four small setae. The hysterosoma has a faintly striated, shagreened appearance. There are four rows of small setae on the hysterosoma; six setae in the first or anterior row, six in the second, four in the third, and only two in the last row. The hypopus is finely granular both dorsally and ventrally. The number and arrangement of the leg setae, and other leg structures of the hypopus, are not, as expected, identical with the adult. However, there is no difficulty in homologizing many of these structures with those of the adult. These setae and structures are shown for all the legs in Fig. 6. and an enlarged view of leg I is shown in Fig. 5. Mention many now be made of some of the more conspicuous differences between the hypopus and adult legs. A single claw is found on the tarsus of each of the first three legs, but not on tarsus IV. In the latter there is an extremely long, thin seta instead of

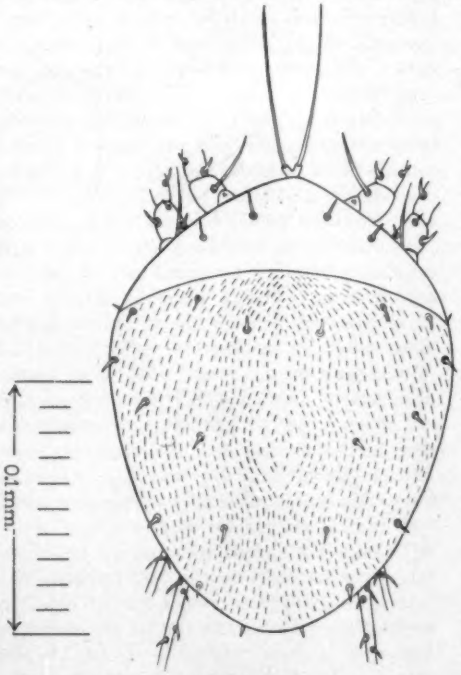

FIG. 7.—*Histiostoma laboratorium*, n.sp.: Hypopus, dorsal view.

a claw. Tarsi II and III have rather long hairlike setae similar in appearance to those on tarsi I and II of the adult. Tarsus I has a structure with a shape similar to the end of a golf club substituted for similarly placed setae on tarsi II and III. This structure could possibly function as either a suction cup or a sensory organ. The tarsal spinules of adult legs appear to be missing in the hypopus. These could be present but of such a minute size as to be overlooked. The macrosense organs are seen in a similar position to those of the adult, although no bristlelike setae have a common origin with them as seen in the tibial macrosense organ of leg I of the adult. Only trochanter III of the hypopus has a seta. However, femora I, II, and IV have long setae somewhat similar in shape and size to the setae on trochanters I, II, and III of the adult. Trochanter I has an extremely minute spicule reminding one of an incipient seta. The interpretation of the segments of leg III and IV is shown in Fig. 6. If this interpretation is correct genua III and IV are represented in the hypopus by small, almost vestigial segments.

Type.—Holotype male, allotype female and hypopus, and several paratypes of both sexes and hypopus are being deposited in the U. S. National Museum.

Remarks.—These studies were based on many specimens, conforming to type forms. The most satisfactory observations were made on living specimens mounted in Methocel, which slows but does not kill for as long a period as several hours. Colonies of this species were started from specimens originally found in a *Drosophila* culture from a biological supply house.

This species is easily cultured on any of the common *Drosophila* culture media, such as cornmeal-molasses-agar. At room temperature the life cycle is completed in 5 to 6 days. Unfertilized eggs obtained from isolated virgin females give rise to males only, furnishing another instance of haploid parthenogenesis in the Acarina. It is suspected that the natural distribution of his species is widespread. This statement is based on preliminary collections in the vicinity of Richmond, Va., as well as the general observation of its frequent occurrence in genetic laboratories in many parts of the United States. The normal variation in size of mites of the same species of a family when cultured under optimum condition is not known. However, the size range as noted above appears to be unusually great, leading one to suspect genetic differences are involved. This and other aspects of the biology of this species are now under investigation.

ENTOMOLOGY.—*A synopsis of the chloropid genera* Chaetochlorops *and* Eugaurax (*Diptera*).[1] CURTIS W. SABROSKY, Bureau of Entomology and Plant Quarantine.

In the family Chloropidae, a formula of 1+2 notopleural bristles (one anterior and two posterior) occurs so generally that it might almost be cited as a family character. Some genera and species have 1+1, or occasionally 0 + 1, but even in these cases close inspection sometimes shows that the difference is only one of degree and that there is present in the expected position a single hair or hairlike bristle corresponding to the apparently missing notopleural.

In the New World two genera, *Chaetochlorops* and *Eugaurax*, show unexpected numbers of notopleurals, the formula ranging from 2 + 3 to 3 + 17, with correspondingly greater numbers than usual along the posterior margin of the mesonotum and on the sides of the scutellum. In view of their distinctive habitus, the two genera may conveniently be considered together in this paper. Actually they are derived from quite different lines, however, as *Chaetochlorops* belongs with the *Epimadiza-Goniopsita-Polyodaspis* complex of genera, whereas *Eugaurax* is near *Conioscinella*.

The two genera may be separated by a number of significant characters, besides the useful though perhaps superficial difference in color.

KEY TO CHAETOCHLOROPS AND EUGAURAX

1. Postvertical bristles stout, straight, parallel or slightly diverging, directed slightly caudad; eye bare, at most a few exceedingly minute hairs visible under high magnification; front rather shining (the German "fettglänzend"),

[1] Received March 30, 1950.

without pollen; proboscis elongate and genigulate, with both sections slender, corneous, and nearly as long as greatest length of head; thorax polished black, rest of body and legs predominantly so.

(*Chaetochlorops* Malloch) 2

Postvertical bristles straight and strong, but cruciate at tips; eye distinctly pubescent; front dull; proboscis short, the labella broad and fleshy, not 0.40 as long as greatest length of the head; yellow species with reddish to black stripes on mesonotum.

(*Eugaurax* Malloch) 3

CHAETOCHLOROPS

2. Fore coxa black (definitely infuscated even in teneral specimens); cheek relatively broad, 0.31–0.40 times height of an eye and 0.83–1.0 times breadth of third antennal segment; Nearctic.....*C. inquilina* (Coquillett)

Fore coxa testaceous, sharply contrasted with black femora; cheek appearing narrower, 0.25–0.30 times height of an eye and 0.74–0.90 times breadth of third antennal segment; Neotropical.....*C. scutellaris* (Becker)

EUGAURAX

3. Presutural bristle absent; thoracic chaetotaxy not extreme, with only one row each of prescutellar and marginal scutellar bristles, no intrahumerals, and usually only one strong humeral, if any..... 4

Presutural bristle present, sometimes 2 or 3 bristles in the presutural position; thorax strongly bristled as in *Chaetochlorops* (except in *E. intermedia*), with numerous humeral and intrahumeral bristles, 2 or 3 somewhat irregular rows of prescutellars, and 2 or 3 rows of marginal scutellars..... 8

4. Mesonotal stripes polished black, not at all pollinose; 4 black pleural spots, on meso-, sterno-, ptero-, and hypopleuron; cheek broad, subequal to breadth of third antennal segment and 0.40 times height of an eye (Chile).....*E. pleuralis* Malloch

Not as above, the entire mesonotum somewhat duller, sparsely or distinctly covered with pale pollen (unknown for *bipunctata*, but that species has entirely yellow pleuron); cheek obviously narrower than the proportion stated above..... 5

5. South Temperate Zone species (Argentine, Uruguay)[2]..... 6

North Temperate Zone species (Florida to Canada)..... 7

6. Back of head with black spot above the neck; mesonotum with black markings confined to a streak on each side between mesonotal suture and hind margin[3].....*E. bipunctata* Malloch

Back of head entirely pale yellow; mesonotum with four brown to black stripes, the central pair nearly fused[2].....*E. bicolor* Malloch

7. Mesonotum light yellow with three (or four)[4] stripes, typically the broad median stripe entirely reddish except on anterior declivity opposite the occipital spot, and the lateral stripes reddish with posterior two-fifths black, the over-all effect being a predominantly reddish notum with two elongate-oval lateral black spots on posterior third; black occipital spot small, opposite middle of eye and separated from the eye by a yellow band at least twice as wide as the ocellar triangle; hypopleuron yellow; southeastern U. S.

E. floridensis Malloch

Mesonotum with three (or four) broad black stripes; occipital spot much more extensive, the post-ocular yellow band separating it from the eye equal to or little more than the distance between posterior ocelli; hypopleuron with elongate-oval black spot; northeastern U. S., southeastern Canada.

E. floridensis vittata, n. subsp.

8. Thorax with only one row each of prescutellar and marginal scutellar bristles; no intrahumeral bristles (Costa Rica).

E. intermedia, n. sp.

Thorax more strongly bristled, with two or three somewhat irregular rows of prescutellar bristles and two or three rows of marginal scutellars; cluster of intrahumeral bristles mesad of each humerus..... 9

9. Two rows of moderately strong, black bristles along lower margin of cheek (Colombia, Panama).....*Eugaurax* sp.

Cheek with short, fine, pale yellow hairs along lower margin.

Eugaurax spp. (*quadrilineata*, etc.)

Genus **Chaetochlorops** Malloch

Chaetochlorops Malloch, Can. Ent. 46: 120. 1914. One species. Type, *Siphonella inquilina* Coquillett, by original designation and monobasic.

As I have pointed out elsewhere in a review of the Chloropidae of the Ruwenzori Expedition (Brit. Mus. Nat. Hist., in press), the Old World genera *Anacamptoneurum*, *Polyodaspis*, *Epimadiza*, and *Goniopsita* and the New World genus *Chaetochlorops* are all closely related and form a distinct group. It is even probable that fewer genera should be recognized, but conclusions must be based on a broader study than in possible at this time. The species of *Polyodaspis* are intermediate between normally bristled *Goniopsita* and strongly bristled *Chaetochlorops*. Even the de-

[2] Having no material of *bipunctata* and *bicolor* for study, I can only include them here, for completeness, by geographical division.

[3] After MALLOCH, *Diptera of Patagonia and S. Chile*, pt. 6, fasc. 5: 422–425. 1934.

[4] The median pair of stripes, in all *Eugaurax*, may be narrowly separated, either full length or partly, or may be fused to form one broad median stripe which is about twice the width of a lateral stripe.

velopment in *Chaetochlorops* of a strong presutural bristle cannot be considered a generic character, for it is also developed in some African *Polyodaspis*, though not in the Palearctic genotype, *P. ruficornis* (Macquart). Likewise, some species of *Eugaurax* have presuturals, though others do not.

In Chile there is a parallel case in another genus. *Hippelates stigmaticus* (Duda) (syn., *Chaethippus subannulatus* Malloch) has usually about 3 + 5 notopleural bristles, a strong presutural bristle, a transverse row of prescutellars, and more lateral scutellars than usual. However, because *stigmaticus* is a reasonably characteristic *Hippelates* s. str., i. e., a dull, heavily gray pollinose species with a strong, curved hind tibial spur, the development of bristles appears in this case also to be of only specific significance.

In both *Eugaurax* and the Old World *Polyodaspis* the development of the presutural bristle seems to be characteristic of tropical forms.

Chaetochlorops inquilina (Coquillett)

Siphonella inquilina Coquillett, Journ. New York Ent. Soc. **6**: 48. 1898a (Va., Mo.); U. S. Dept. Agr. Div. Ent. Bull. 10 (n. s.): 75. 1898b (habits).
Chaetochlorops inquilina (Coquillett) Malloch, Can. Ent. **46**: 120. 1914.

As with many of Coquillett's species, no holotype was clearly designated in publication, though in the collection a red "type" label was placed on the specimen bearing his name label, and red "paratype" labels on the remaining specimens. To be definite, and to avoid confusion with those who believe that the phrase "Type No. 3807, U. S. Nat. Museum" did designate the type (as Coquillett perhaps intended), I hereby select as lectotype the specimen which carries the red "type" label, Coquillett's name label, and the further labels "No. 931" and "Puparium found in apple. Iss. May 28–81." No locality is given. The data are elaborated slightly in Bulletin 10, p. 75 (l. c.), based on original notes by Theodore Pergande, to which the no. 931 refers.

Distribution of *inquilina:* Widely distributed in the eastern and middle States, from Massachusetts to Florida and west to South Dakota and Texas, to judge by over 150 specimens personally identified from 51 localities in 23 States and the District of Columbia, as follows: Alabama, Arkansas, Connecticut, District of Columbia, Florida, Illinois, Indiana, Kansas, Louisiana, Maryland, Massachusetts, Michigan, Mississippi, Missouri, New Jersey, New York, Ohio, Oklahoma, Pennsylvania, South Carolina, South Dakota, Texas, Virginia, West Virginia. Westernmost records: Elk Point and Canton, S. Dak.; Onaga, Kans.; Ada and Hugo, Okla.; Ebony and Brownsville, Tex. Collecting records range from April 25 (District of Columbia) to October 3 (New Jersey) in the north, and February 17 (Brownsville, Tex.) to September 30 (Mississippi) in the south.

Notes on some interesting behavior, possibly courtship, of the adults of this species were published by Steyskal (Brooklyn Ent. Soc. Bull. **37**: 102. 1942).

Food habits of larvae: Knowledge of the food of most Chloropidae is slight or nonexistent, and it is always of significance to record what is known. In this instance the species appears to be reared more often than it is collected, and there is accordingly a surprisingly large accumulation of rearing records. Few of these critically determined the exact food and whether the larvae were parasitic, predaceous, or saprophagous. Though it is not impossible that the larvae may be parasitic or predaceous, at least at times, the fact that they are associated with damage by such a wide variety of insect pests to many different kinds of plants suggests that they feed in frass and decaying plant tissues together with or following the primary cause of the damage.

The rearing records known to me have been arranged in the following list according to the insect with which *inquilina* larvae were associated. In a second list they are arranged by the host plant, for those cases where no other is specifically mentioned on the labels.

Acrobasis caryae Grote (pecan nut casebearer): "Two flies . . . emerged from puparia inside of the [fifth stage] host larva" (Ebony, Tex.).

Anthonomus grandis Boheman (boll weevil): "In rotten cotton bolls" (Tuscaloosa, Ala.); "Par-[asite] *Anthonomus grandis*" (Alexandria and Tallulah, La.; Hugo, Okla.); "bred from cotton squares" (Laurinburg, N. C., *fide* Brimley, 1938, *Insects of North Carolina*, p. 387); "reared from boll weevil infested cotton sq[uare]" (Florence, S. C.).

Carpocapsa pomonella (Linnaeus) (codling moth): Puparium found in large cavity in apple, presumably made by codling moth (lectotype); about 150 specimens "reared from wormy apples," June–July 1940 (Glassboro, N. J., *teste* E. J. Hansens, in litt.); further specimens, August 1943, believed to be "breeding in the frass [from codling moth larvae] or in the rotting apples themselves" (Glassboro, N. J., *teste* W. F. Rapp, Jr., in litt.).

Conotrachelus spp. (nut curculios): From puparia found with *Conotrachelus* larvae [probably

aratus Germar] attacking base of compound leaves of *Hicoria* sp. (Lyme, Conn.); "reared from pecan twig injured by *Conotrachelus aratus*" (Miss.); listed as a rather abundant and important "parasite" of the butternut, black-walnut, and hickory-shoot curculios, *Conotrachelus juglandis*, *C. retentus*, and *C. aratus* (Brooks, U. S. Dept. Agr. Dept. Bull. 1066: 7, 11, 16. 1922).

Ecdytolopha insiticiana Zeller: Par[asite] of *E. insiticiana* in *Robinia*" (Falls Church, Va.).

Epiblema scudderiana (Clemens): Bred from *Euryptychia saligneana* [= *E. scudderiana*] in galls from *Solidago* (presumably Vineland, N. J.). Associated notes state that the specimen was sent to C. V. Riley, September 23, 1870, by "Mrs. Treat," probably Mrs. Mary Treat, of Vineland, N. J., mentioned in Riley's Missouri reports. The specimen has not been located, but Coquillett's record can be accepted without question.

Grapholitha molesta (Busck) (Oriental fruit moth): "Emerged in cage with *L[aspeyresia] molesta* larvae" (Chambersburg, Pa.).

Itonidid galls on *Rudbeckia:* "The gall when first found did not contain any cecidomyiid, and the *Siphonella* had evidently lived as an inquiline after the original occupants had abandoned the gall" (St. Louis, Mo.; lectoparatypes; reported by Coquillett, 1898b, *op. cit.*, p. 75 as reared from gall on *Aster*, but the plant was later determined as *Rudbeckia laciniata*); "*Cecidomyia* galls on *Rudbeckia laciniata*" (Penryn, Pa.)

Laspeyresia caryana (Fitch): "In pecan hulls with *Laspeyresia caryana*" (Mound, La.).

Proteoteras aesculana Riley: "Pupae found inside burrow" in young shoots of young maple trees, made by *Proteoteras*, May 30, 1873, noted by O. Lugger (probably Missouri).

Psacaphora cephalanthiella (Chamb.): "Adults . . . issued from twigs of *Cephalanthus occidentalis* . . . ; the twigs were also infested by caterpillars of *Laverna cephalanthiella* Chamb." (Va., recorded by Coquillett, 1898b: 75; 24 lectoparatypes).

Pyrausta penitalis Grote: "Bred from the boring in stem of *Polygonum*, probably done by the above moth [*P. penitalis*]" (Lafayette, Ind.).

Rhyssomatus lineaticollis Say: "Bred from decayed seed pods of *A[sclepias] syriaca* . . . first injured by the larvae of *Rhyssematus*" (New Brunswick, N. J., *fide* Weiss and Dickerson, Journ. New York Ent. Soc. **29**: 144. 1921).

Tortrix on rose: "Par[asite] on Tachinid on *Tortrix* on Rose" (Kirkwood, Mo.).

Records associated only with a plant, as far as data on labels are concerned, are the following:

Ambrosia: "Bred from *Ambrosia trifida*" (Kinderhook, Ill.).

Bidens: "Bred from stem of *Bidens*" (Greenport, L. I., N. Y.).

Carya: "Bred from hickory nuts" (A & M College, Miss.).

Carya illinoensis: "*Hicoria pecan*" (Logansport, La.).

Cucurbita pepo: "Bred from old pumpkin vines" (Washington, D. C.).

Datura: "Bred from *Datura stramon[ium]* pod" (Ada, Okla.).

Helianthus: "Reared from sunflower decay," "reared from sunflower floret," and "*Helianthus annuus*" (Webster Groves, Mo.).

Hibiscus: "Bred from *Hibiscus*" (Chesapeake Beach, Md.).

Juglans cinerea: "Bred from shuck of butternut" (Plummers Island, Md.).

Solanum: "Emerged from a berry of *Solanum carolinense*" (Kirkwood, Mo.; lectoparatype, record published by Coquillett, 1898b, *op. cit.*, p. 75).

Zea: "Bred from stored corn" (Bladensburg, Md.).

Chaetochlorops scutellaris (Becker)

Siphonella scutellaris Becker, Ann. Mus. Nat. Hung. **14**: 449. 1916. (Higuito, Costa Rica).
Goniopsita inquilina (Coquillett) (syn. *scutellaris*) Duda, Folia Zool. Hydrobiol. **2**: 73. 1930.
Chaetochlorops inquilina (Coquillett) (syn. *scutellaris*) Duda, Konowia **12**: 200. 1933.

I do not agree with Duda in placing *scutellaris* in synonymy. The two species are unquestionably very similar, but the consistent difference in the color of the fore coxa and in the proportionate width of the cheek convinces me that two species are involved.

Specimens examined: In addition to the holotype [Hungarian National Museum, Budapest], I have seen 18 specimens, all from the type locality. Aldrich (Card Catalogue, U. S. National Museum) has also recorded it from Barro Colorado Island, Panama Canal Zone (J. Zetek), "from *Bombacopsis fendleri*."

Genus **Eugaurax** Malloch

Engaurax Malloch, Ins. Insc. Menstr. **1**: 46. 1913. One species. Type *E. floridensis* Malloch (original designation and monobasic).

Eight described species are referable to *Eugaurax*, to which number are added in this paper one new species, one new subspecies, and one unnamed species. On the presence or absence of presutural bristles, the species fall into two groups, which correspond also with a geographical division. Four described species and the new subspecies, lacking presuturals, are Temperate Zone forms, either north or south. The others, possessing one or more presuturals, are tropical to subtropical. In all but one of this second group, the posterior part of the thorax is also densely bristled, with two or three irregular rows of prescutellars and a like number of rows of marginal

scutellars. The exception, *E. intermedia*, n. sp. (Costa Rica), has a presutural bristle, but only one row each of prescutellars and marginal scutellars, and is thus intermediate between the tropical and temperate zone species.

Nothing is known of the food habits of the larvae. The only clue known to me is that a series of specimens in the collection of the U. S. National Museum, from Spring Lake, Fla., February 28 and March 3, 1930 (N. C. Nicoll), is labeled "Egg plant." The specimens are teneral and may have been reared.

SPECIES OF SOUTH TEMPERATE ZONE

Eugaurax bicolor Malloch, Diptera Patagonia and S. Chile, pt. 6, fasc. 5: pp. 422, 424. 1934. (Buenos Aires, Argentina).

Eugaurax bipunctata Malloch, ibid.: 422, 423 (Montevideo, Uruguay).

Eugaurax pleuralis Malloch, ibid.: 422 (Chile).

E. pleuralis is the only species of *Eugaurax* known to me which has the mesonotum polished, lacking the pollinose appearance of the others. It is also unique in its broad cheek and black-spotted pleuron.

Eugaurax floridensis Malloch

Eugaurax floridensis Malloch, Ins. Insc. Menstr. 1: 46. 1913. (Fla., N. J.).

Little can be added to Malloch's description, except to note the error, undoubtedly a *lapsus calami*, in crediting the species with "two notopleural and four supraalar bristles." All are notopleurals, two anterior and four posterior, a formula that occurs in all five specimens known to me. The mesonotal pattern is characteristic. The narrow occipital spot is conspicuously bidentate dorsally by reason of a large V-shaped yellow area behind the frontal triangle.

Specimens examined: Holotype female, Biscayne Bay, Fla., and two paratypes (♂, ♀), Atlantic Beach, Fla.; ♀, Sebastian, Fla., February 10, 1919 (A. Wetmore) [U. S. National Museum]; ♀, Jackson County, Iowa, June 15, 1934 (H. C. Knutson) [Iowa Wesleyan College].

The only published record known to me is "NY" in the "List of the Insects of New York" (1928, p. 861), but it is probable that this really refers to *E. floridensis vittata*. The paratype from Riverton, N. J., "7–3–98," which is not typical *floridensis*, is somewhat intermediate with *vittata*.

Eugaurax floridensis vittata, n. subsp.

As described for *floridensis* but with much darker habitus, differing in having three (or four) broad black mesonotal stripes, a broader occipital spot, and a hypopleural spot. There is some variation in the number of posterior notopleurals, with two specimens having five and six, but with so few specimens this does not necessarily indicate a characteristic trend for the northern race. No difference was observed in the male genitalia.

Holotype female and allotype, Lafayette, Ind., August 4 (J. M. Aldrich). U.S.N.M. type no. 59626. Paratypes: 2 (♂, ♀), topotypical, June 16, 1915 and August 5 (Aldrich) [USNM]; ♂, Algonquin, Ill., May 29, 1896 [Illinois Nat. Hist. Survey]; 2 (♂, ♀), Norway Bay, Quebec, August 24, 1938 [Canadian National Collection].

The paratype of *E. floridensis* Malloch from Riverton, N. J., is intermediate but closer to *vittata*, as noted above.

Eugaurax intermedia, n. sp.

Female: Predominantly light yellow, marked with black as follows: Arista except for thickened basal segment, ocellar spot, moderately broad occipital spot, three mesonotal stripes posterior to mesonotal suture, metanotum, and dorsum of abdomen except for large basal spot and narrow yellow margins and apex; mesonotal stripes dark reddish anterior to suture, but this color is probably variable; median stripe twice the width of a lateral and extending beyond the latter to the base of the scutellum; supraalar area and pleuron entirely yellow; bristles brown to blackish.

Front somewhat collapsed, in life probably narrower than an eye; cheek narrow, one-seventh the height of an eye and less than half the breadth of the third antennal segment, the lower margin with short, fine, pale yellow hairs; third antennal segment subreniform, 1.5 times as broad as long; arista long pubescent; thoracic chaetotaxy: 1 weak, hairlike humeral, 2 + 5 notopleural, 1 presutural, 2 postalar, 10 bristles in single prescutellar row, and 1 apical and 4–5 marginal scutellars in a single row. Venation normal for the genus.

Length, 2 mm.

Holotype female, Higuito, San Mateo, Costa Rica (Pablo Schild). U.S.N.M. type no. 59627.

Although this species is represented by a unique specimen, I have no hesitation in describing it at this time because of the distinct chaeto-

taxy. It possesses a presutural bristle as do the other tropical species, but unlike the others it has only single rows of prescutellar and marginal scutellar bristles.

Eugaurax sp.

Three specimens, one collected at Las Palmas near Pacora, Panama, one at Miami, Fla., on plane from Barranquilla, Colombia, and one at Brownsville, Tex., on plane from the Canal Zone, indicate the presence of a distinct species in Central America. None of the specimens is in good condition, however, and the species will not be described until more material is available. The strong cheek bristles are a distinctive feature, compared with other known species of the genus.

Eugaurax spp. (**quadrilineata,** etc.)

Four described species pass to the end of the key, as follows:

Eugaurax quadrilineata (Williston), Diptera of St. Vincent: p. 422. 1896 (*Oscinis;* St. Vincent); Coquillett, Proc. U. S. Nat. Mus. **22:** 266. 1900 (*Oscinis;* oc. Puerto Rico); Duda, Folia Zool. Hydrobiol. **2:** 99. 1930 (*Conioscinella;* oc. Costa Rica). NEW COMBINATION, from type in British Museum (Nat. Hist.).

E. insularis Malloch, Ins. Insc. Menstr. **1:** 64. 1913 (Puerto Rico). Although not so stated in the original description, the type and paratype of *insularis* appear to have been the specimens recorded by Coquillett (1900) as *quadrilineata.*

E. hystrix (Duda), *op. cit.:* 99. 1930 (*Conioscinella;* Brazil). NEW COMBINATION, from holotype male, Petropolis, Brazil (Borgmeier) [type in Instituto Biológico, São Paulo, Brazil, lent for study through the courtesy of the late Oscar Monte.].

E. fasciventris (Duda), *op. cit.:* 102. 1930 (*Conioscinella formosa* var.; Peru). NEW COMBINATION, from female, presumably holotype, Callao, Peru, June 3, 1913 (R. Paessler), examined 1937 in Zoologisches Museum at Hamburg, Germany (type now destroyed).

In addition to the type and paratype of *insularis,* I have before me 23 specimens, chiefly teneral or in mediocre condition, from Florida (Biscayne Bay, Cape Sable, Spring Lake), Cuba, Jamaica, and the Panama Canal Zone. Possible differences may exist in the width of the front and in the presence or absence of black supraalar vittulae, but the present material is not suitable for further study. I am inclined to believe that at least *insularis* and possibly *hystrix* are synonyms of *quadrilineata,* but these and other questions must await adequate series in good condition.

ZOOLOGY.—*Some new and rare Pacific pagurids.*[1] BRYCE C. WALTON, Allan Hancock Foundation, University of Southern California. (Communicated by F. A. CHACE, Jr.)

The comparatively recent existence of a juncture between the Atlantic and Pacific Oceans in what is now the Panama area would presuppose the existence of rather closely related decapod forms on the two sides of the isthmus. A preliminary examination of the Paguridea collected by the Allan Hancock Pacific Expeditions disclosed the presence of the following two undescribed species, which are closely related to rather unique Caribbean forms not previously reported from the Pacific side, and also a series of both sexes of a rare scutellated hermit previously known only from the Bay of Panama.

[1] Contribution from the Allan Hancock Foundation. Received March 24, 1950.

Family PYLOCHELIDAE Spence-Bate, 1888

Genus **Parapylocheles** Alcock, 1905

Parapylocheles glasselli, n. sp.

Fig. 1

Type.—Male holotype, A.H.F. no. 401, from Ensenada de San Francisco, Sonora, Mexico, 16 fathoms; collected February 7, 1940, by the *Velero III* at station 1087–40.

Diagnosis.—Chelipeds equal, similar, devoid of spines or granules. Carapace smooth, polished, precervical portion a little longer than wide. Rostral point broad, triangular, with truncate apex, extending between the base of eye stalks, lateral points wanting. Eye stalks short, stout, constricted in the middle; the cornea dilated and the ophthalmic scales completely lacking.

Antennal acicle narrow, triangular, and reduced. Second and third pereiopods exceeding chelipeds in length. Tail fan symmetrical, telson not divided by sulci, uropods without scabrous pavement of corneous granules.

Description.—Chelipeds equal, similar, smooth, with only a few scattered setae. Lateral margins slightly swollen, with the widest point approximately at the middle of the palm. Fingers acuminate, short, about one fourth the total length of the manus. Carpus about one-third the length of the manus, narrow proximally, but flaring to approximately width of manus distally. Anteromedial corner produced into a blunt tubercle. Merus twice the length of carpus, with no distinct crest.

External maxillipeds noncheliform and flagellate.

Precervical portion of carapace slightly longer than wide, transversely convex, more coriaceous than calcareous. Rostral point broadly triangular with apex truncate, not extending beyond coxal segment of eye stalks, lateral points lacking. Postcervical region divided into a leathery median plate which narrows sharply posteriorly, and two larger lateral plates which become more membranous laterally.

Eye stalks short, terete, stout, and constricted in the middle; the cornea well developed and dilated. The ophthalmic scales are completely wanting, exposing the coxal articulation of the eye stalk.

Antennal acicle narrowly triangular, convex, and very short, extending only one half the length of the eye stalk; lightly setose and with entire margins. Antennal peduncle longer than the eye stalk when extended, exceeding it by the length of the very short fourth, and fifth, articles; flagellum with only a few scattered setae, and exceeding the reach of the chelipeds by one third its length.

Antennular peduncle longer than the eye, exceeding it for one third the length of the terminal peduncular article; flagellum consisting of approximately 12 annulations and densely setose beneath.

Second and third thoracic legs a little longer than the chelipeds, compressed, not crested, and with the exception of the dactyls, very sparsely setose. Dactyl curved, subequal to the propodus in length, and terminating in a sharp, horny claw. Fourth thoracic appendage subcheliform. Anterior face of the coxae of the fifth pair, which are cheliform, produced into low cone-shaped tubercles bearing the male genital pores.

Abdominal terga distinct and symmetrical, with the first and last smaller. There are no pleura, and on the ventral surface the somites are distinguishable only by very slight constrictions. Abdominal appendages biramous; the posterior blade being reduced in all four pairs, which are practically of uniform size.

Telson symmetrical, spade shaped, unmarked by sulci, with eighteen heavy, evenly spaced setae along the distal margin. Uropods large, both blades flattened and membranous, the posterior blade the smaller, both with serrate, setose margins, and completely lacking a scabrous surface.

Measurements.—Total length (rostral point to tip of abdomen) 11 mm; length of carapace 5 mm; length of precervical region 2.75 mm; width of precervical region 2.25 mm; length of manus 3 mm; length of fingers 0.75 mm; length of carpus 1 mm; length of dactyl, second thoracic leg 2 mm; length of propodus, second thoracic leg 2.5 mm; length of telson 1.75 mm.

Distribution.—Gulf of California at Ensenada de San Francisco, Sonora, and Southwest Cove of San Francisco Island, Baja California.

Discussion.—A comparison of this species with *P. scorpio* (Alcock), heretofore the sole species in the genus, reveals some differences in characteristics that usually would be considered generic, rather than specific. The most obvious of these is the reduction in the number of pleopods, the specimen before me having but four pairs instead of five, as in *P. scorpio*. Likewise the complete absence of ophthalmic scales and the scabrous area of the uropods would also be in this category, since presence or absence of structures has been considered generic characters, while differences in degree or manner of possession constitute specific characters. The variation in the number of pleopods within a genus has a precedent, however, the male of *Pagurus variabilis* (Milne-Edwards and Bouvier) having three, instead of the usual four pleopods. Also the general proportions, the nonoperculiform nature of chelipeds, the noncheliform external maxillipeds, which are approximated at the base, the telson not marked by sulci, and the twelve pair of branchiae make this form identifiable as *Parapylocheles*.

Though a notation of the small, poorly developed eye of *P. scorpio* is given in the generic description by Alcock, this characteristic is one of

degree and should not by itself be considered of generic importance; thus the possession of robust, well-developed eyes by *P. glasselli* would not forego its inclusion in the genus. A case in point is shown within this small family when the genus *Chiroplataea* was separated from *Pylocheles* on the basis of this character by Spence-Bate. Alcock himself (1905) and Milne-Edwards and Bouvier all agree that in spite of the lack of well-developed eyes *Chiroplataea* should be considered synonymous with *Pylocheles*.

Thus, while the differences between *P. glasselli* and the genotype seem to be as great as those between *P. scorpio* and other genera such as *Pylocheles* or *Mixtopagurus*, the writer feels that there would be little merit in erecting a new genus, even if these suppressions prove to be constant when more specimens are obtained.

Remarks.—This species is named for the late Steve A. Glassell, who has made many significant contributions to the knowledge of the decapod fauna of Pacific waters.

This constitutes the first record from American Pacific waters of this small and interesting family, as well as for the genus.

Family PAGURIDAE Dana, 1852

Genus **Xylopagurus** Milne-Edwards, 1880

Xylopagurus cancellarius, n. sp.

Fig. 2

Type.—Female holotype, U. S. N. M. no. 90384, from off Port Utria, Colombia, in 20 fathoms; collected by the *Velero III*, February 15, 1934, at station 238–34.

Paratype.—Male, A. H. F. no. 343, collected with the holotype.

Diagnosis.—Ophthalmic scales narrow, constricted in the center, rounded distally with 9 or 10 upward-curving spines on the distal margin. Dorsal surface of carpus of large cheliped with a strongly raised median ridge, which extends slightly beyond anterior margin of carpus; proximal margin of manus notched to receive it. Fifth thoracic legs subcheliform. Abdominal shield with four prominent conical tubercles, one pair just anterior, and the other just posterior to a central pitlike depression; not marked by discreet longitudinal sulcus.

Description.—Chelipeds unequal, dissimilar, the right vastly larger. Inner margin of manus prolonged into a triangular tubercle two-thirds as large as immovable finger; fingers strongly curved, occluding only at tips, moderately setose. Palm laterally convex throughout the proximal half of its length, concave at the base of the fingers, the distal two-thirds covered with conical granules, the proximal one third smooth. Lateral margins of the palm subparallel, setose, and the proximal dorsal margin notched to receive the carpal crest. Carpus triangular in cross section, with the apex the prominent dorsal crest; merus as long as carpus, crest less well developed.

Minor cheliped very weak, less than one-third the width of the large cheliped and reaching only to the distal edge of the carpus of the major hand. Palm subcylindrical, smooth, lightly setose; carpus cylindrical, smooth, not crested.

External maxillipeds not approximated at base, the biarticulate ischium large, with dorsomedian margin serrate, and a conspicuous curved spine on the medial surface. All three pairs flagellate.

Precervical portion of carapace longer than wide, smooth, well calcified, strongly convex. Rostral point triangular, acute, lateral points angular, reduced, extending only to base of rostral point. Postcervical portion with well calcified median plate and lateral plates becoming membranous marginally.

Eye stalks are stout, widening distally; the ophthalmic scales small, directed medially, narrow, constricted in the center, rounded distally, with 9 or 10 upward-curving spines on the distal margin.

Antennal acicle very much reduced, extending no farther than do the eye scales, very narrow, with serrate distal margin; antennal peduncle reaching only to base of cornea when extended. Flagellum setose and short, not exceeding the large cheliped in length.

Second and third thoracic legs compressed, smooth, polished, and reaching beyond the base of the fingers of the major cheliped. Dactyl only sparsely setose and equal in length to propodus. Coxae of the third pair bearing the prominent circular genital openings on the ventral surface. Fourth pair subcheliform and having the distinctive large oval rasp as in *X. rectus*; the fifth pair having the movable finger so reduced as to be almost vestigial resulting in a subcheliform condition.

Abdominal terga weakly calcified, asymmetrical, larger on the left side, and not in contact with one another. Abdominal appendages unequally biramous, posterior blade being larger.

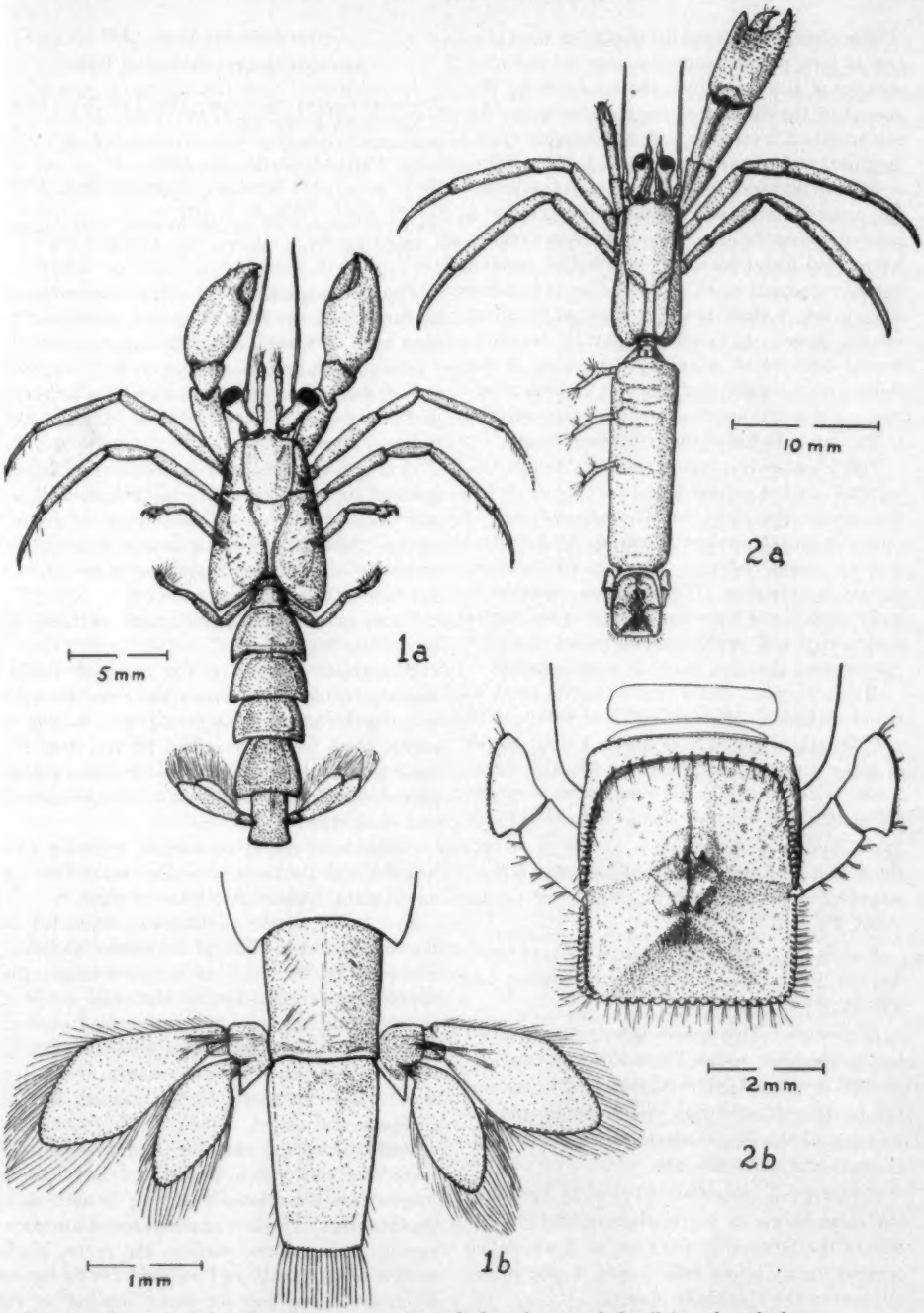

FIG. 1.—*Parapylocheles glasselli*, n. sp.: *a*, Dorsal view; *b*, extended tail fan, dorsal view.
FIG. 2.—*Xylopagurus cancellarius*, n. sp.: *a*, Dorsal view; *b*, Caudal "shield," dorsal view.

The conspicuous caudal "shield," a modification to form an operculum to close the posterior opening of the vegetable tube inhabited by the animal, is the distinctive mark of the genus. In this species it is strongly calcified, roughly quadrangular, and apparently formed by the fusion of the two posterior terga. There is a raised margin around the entire perimeter except for a notch marking the line of fusion of the two plates; lateral and distal margins composed of regular, rounded granules, each separated by a rounded sinus in which there is a tuft of setae. Proximal margin merely a raised ridge with regularly spaced fascicles of setae. In the center of the shield are two pairs of prominent conical tubercles, one pair just anterior, and one pair posterior, to the line of fusion of the component terga.

The telson is very much reduced, though well calcified, and is carried flexed forward so it lies flat against the abdomen. The exposed ventral (actually dorsal) surface is marked by a central and two deeper lateral pits, while the terminal margin is spinulose. The uropodal peduncle is well calcified, and the outer surfaces of the blades are covered with conical spines rather than the low rounded granules found in most pagurids.

Measurements.—Total length (rostral point to tip of abdomen) 34 mm; length of carapace 10 mm; length of precervical region 4 mm; length of major manus 7 mm; length of movable finger 2 mm; width of manus 3.5 mm; length of carpus 3.5 mm; length of minor manus 4 mm; width of minor manus 1 mm; length of dactyl second thoracic leg 4.5 mm; length of propodus 5 mm; length of caudal shield 5 mm; width of caudal shield 3.5 mm.

Distribution.—Known only from the type locality, off Port Utria, Colombia, at station no. 238–34.

Discussion.—This species is very closely allied to *Xylopagurus rectus* Milne-Edwards and resembles it quite closely, although the two species can be differentiated very readily by cursory inspection of the caudal shield because the ornamentation is quite different.

Remarks.—*X. cancellarius* evidently has much the same habits as its relative on the opposite side of the Isthmus of Panama, as it was taken wedged tightly into a hollow reed, *Typha* sp., as is usual in the Caribbean species.

Genus **Aniculus** Dana, 1852

Aniculus elegans Stimpson, 1859

Aniculus elegans Stimpson, Ann. Lyc. Nat. Hist. New York **8:** 83. 1859.
Aniculus longitarsus Streets, Proc. Acad. Nat. Sci. Philadelphia **23:** 240. 1871.
Aniculus elegans Stimpson, Bouvier, Bull. Mus. Hist. Nat. Paris **1:** 8. 1895.
Aniculus elegans Stimpson, Boone, Bull. Amer. Mus. Nat. Hist. **63:** 140, fig. 1. 1931.

Type.—Stimpson's type, which was collected at Panama by the Rev. J. Rowell, is believed to have been destroyed in the Chicago fire of 1871.

Neotype.—A female neotype, A. H. F. no. 394, is here designated. This specimen was collected at Taboga Island, station 959–39, May 2, 1939, by the *Velero III*.

Description.—Chelipeds similar, equal, fingers spooned, tipped with horny black hooves, movable finger almost half the total length of manus, carpus trigonal, as wide as manus distally; the underside of both carpus and merus setose, but not tuberculated as in *A. aniculus*.

Third maxillipeds approximated at base, all three pairs flagellate.

Precervical portion of the carapace shield-shaped, slightly longer than wide. *Frontal margin with angular lateral points three-fourths as long as rostral point*, which is marked by two deep circular pits. *Median areolet of gastric region a complete rhomboid*, with the two anterior sides longest and straightest.

Postcervical region coriaceous, widening posteriorly, with the narrow median area defined by an elongate, tonguelike calcareous plate.

Eye stalks slender, cylindrical, expanded at the base and at the base of the cornea. Ophthalmic scales in the shape of a right triangle, the hypotenuse facing laterally. Antennal acicle a narrow acute triangle, *its apex reaching one-half the length of the cylindrical third peduncular article*, which reaches two-thirds the length of the eye stalk. Flagellum short, barely reaching tips of chelipeds, and naked.

Both the second and the third thoracic legs exceed the chelipeds in length, the dactyl being longer than the related propodus in each case. On the meral joint the transverse scutes are interrupted on the dorsal surface, the entire inside surface being smooth and polished. *On the carpus the scutes extend over the dorsal one-half of the*

medial surface, the ventral-medial surface being smooth. Propodus completely ringed by the scutae. Abdomen soft, only slightly coiled, terga ciliated, lobed, not in contact with one another.

Measurements.—The following measurements are for the largest specimen, a male of approximately the same size as Stimpson's type (5 inches). Total length (rostral point to tip of abdomen) 80 mm; length of carapace 41 mm; length of precervical portion 20 mm; width of precervical portion 17 mm; length of manus 23 mm; length of movable finger 11 mm; length of carpus 12 mm; length of dactyl of third thoracic leg 19 mm; propodus third thoracic leg 16 mm; length of telson (including plate) 14 mm.

Distribution.—Boone (1931) states that *A. elegans* was previously known only from West Panama and the Pearl Islands, though E. L. Bouvier (1895) in a list of species of the Diguet collection lists this form with the Baja California fauna. No locality data other than that in the title are given, however, but in a paper by Hariot (1895) on the algal collection of Diguet, made at the same time, the localities given were almost without exception from the pearl dredgings at La Paz. To support this assumption further, among the new species of decapods described by Bouvier in this paper was *Eiconaxius vivesi* "*(dediée a M. Vives, sur le désir de M. Diguet).*" Since Señor G. J. Vives was an official of the Mexican Government at La Paz, and this would be within the normal expected range of a Panamic species, the writer feels it is quite logical to accept this as a record of this species from La Paz.

In the series of six specimens in the Hancock collections are two specimens from Acapulco, Mexico; one from the Tres Marías Islands, Mexico; one from Taboga Island, Panama; one from Secas Islands, Panama; and one from off Cape San Francisco, Ecuador, which represents a southward extension of range.

Two specimens were taken in the intertidal zone, three 2–5 fathoms, and the one from Ecuador in 15 fathoms.

Remarks.—A detailed comparison of the specimens in the Hancock collections with Boone's description in the above-mentioned paper disclosed discrepancies in several characteristics that would lead one to believe that the description was of a species distinct from *A. elegans* since it failed to check not only with these specimens, but also at least in one particular, with Stimpson's and Street's original descriptions.

Through the courtesy of John C. Armstrong, of the American Museum of Natural History, I was able to examine the specimens described by Boone and found that they are *Aniculus elegans* Stimpson. To forestall the possibility of other workers being misled, as was the writer, the species has here been very briefly redescribed and the characteristics not agreeing with Boone's description given in italics.

It seems notable that such a large and conspicuously colored animal could be so consistently missed by collectors in the intertidal zone. It is possible that this form is as obscure as it is rare. Yap-Chiongco (1938) reports that a very closely related species, *Aniculus aniculus* (Fabricius), is fossorial, as this species might well be, which would help to account for its rarity in collections.

One specimen from Acapulco was collected by Dr. Carl L. Hubbs; the other from the same locality by Dr. E. Yale Dawson; and the others in the series were dredged by the *Velero III.*

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ZOOLOGY.—*A new crayfish of the genus* Procambarus *from Oklahoma and Arkansas (Decapoda, Astacidae).*[1]

HORTON H. HOBBS, Jr., Miller School of Biology, University of Virginia. (Communicated by F. A. CHACE, Jr.)

The new crayfish herein described was collected from two localities in the headwaters of Little River in Oklahoma and Arkansas by Dr. Charles E. Burt on June 3, 1934, and the specimens were deposited in the collection of the United States National Museum.

Only three species of the genus *Procambarus* [*P. simulans* (Faxon, 1884: 112), *P. gracilis* (Bundy, 1876: 5), and *P. blandingii acutus* (Girard, 1852: 91)] were reported to occur in Oklahoma by Creaser and Ortenburger (1933), and with the addition of the new species described below, 12 species of crayfishes are now known to be present in the State.

No comprehensive survey of the crayfishes of Arkansas has been made; however, the following species of the genus *Procambarus* are known to occur within its political boundaries: *P. clarkii* (Girard, 1852: 91), *P. blandingii acutus* (Girard), *P. gracilis* (Bundy), *P. simulans* (Faxon), and *P. viaeviridis* (Faxon, 1914: 370).

A key for the identification of the crayfishes of the genus *Procambarus* occurring in Oklahoma and Arkansas is included below.

I wish to express my appreciation to Dr. Burt for supplying me with the data for the specimens on which this new species is based.

Procambarus tenuis, n. sp.[2]

Diagnosis.—Rostrum without lateral spines and acumen indistinctly set off from basal portion; areola narrow with only two punctations in narrowest part; cephalothorax strongly compressed and bearing prominent setiferous punctations between which are crowded numerous smaller ones. Male with hooks on ischiopodites on third and fourth pereiopods; palm of chela of first form male not bearded but bearing a row of seven to nine tubercles along inner margin; postorbital ridges terminating cephalad without spines or tubercles; lateral surface of carapace without spines. First pleopod of first form male terminating in three distinct parts: the noncorneous mesial process thin, triangular, and directed caudally at almost a right angle to the main shaft of the appendage; the plate-like cephalic process, which is contiguous with the mesial one, extends caudodistad from the mesiodistal surface; the corneous central projection, the most prominent of the three terminal elements, arises from the lateral half of the distal end of the appendage, is somewhat compressed and tapering and directed distad and caudomesiad; caudal element represented by a slight knob at the caudolateral base of the central projection. Annulus ventralis with extremely high caudal wall (see Fig. 7).

Holotypic male, form I.—Body ovate, strongly compressed laterally; abdomen narrower than thorax (9.9–10.8 mm in widest parts respectively); width of carapace less than depth in region of caudodorsal margin of cervical groove (10.8–11.5 mm).

Areola narrow, about 16 times longer than broad with two rows of punctations in narrowest part; cephalic section of carapace about 2.3 times as long as areola (length of areola about 30.4 percent of entire length of carapace).

Margins of rostrum converging cephalad to a small corneous upturned apical tubercle; margins somewhat swollen and subtended mesially by a row of setiferous punctations; concave upper surface with a few similar scattered punctations.

Postorbital ridges deeply grooved laterad and terminating cephalad bluntly; subrostral ridges weak and evident in dorsal aspect for only a short distance at base of rostrum; suborbital angle obtuse; branchiostegal spine small and blunt; sides of carapace without spines or tubercles. Surface of carapace punctate except along cephaloventral margin where it is granulate.

Abdomen slightly shorter than thorax (25.9–26.6 mm).

Cephalic section of telson with two spines in each caudolateral corner.

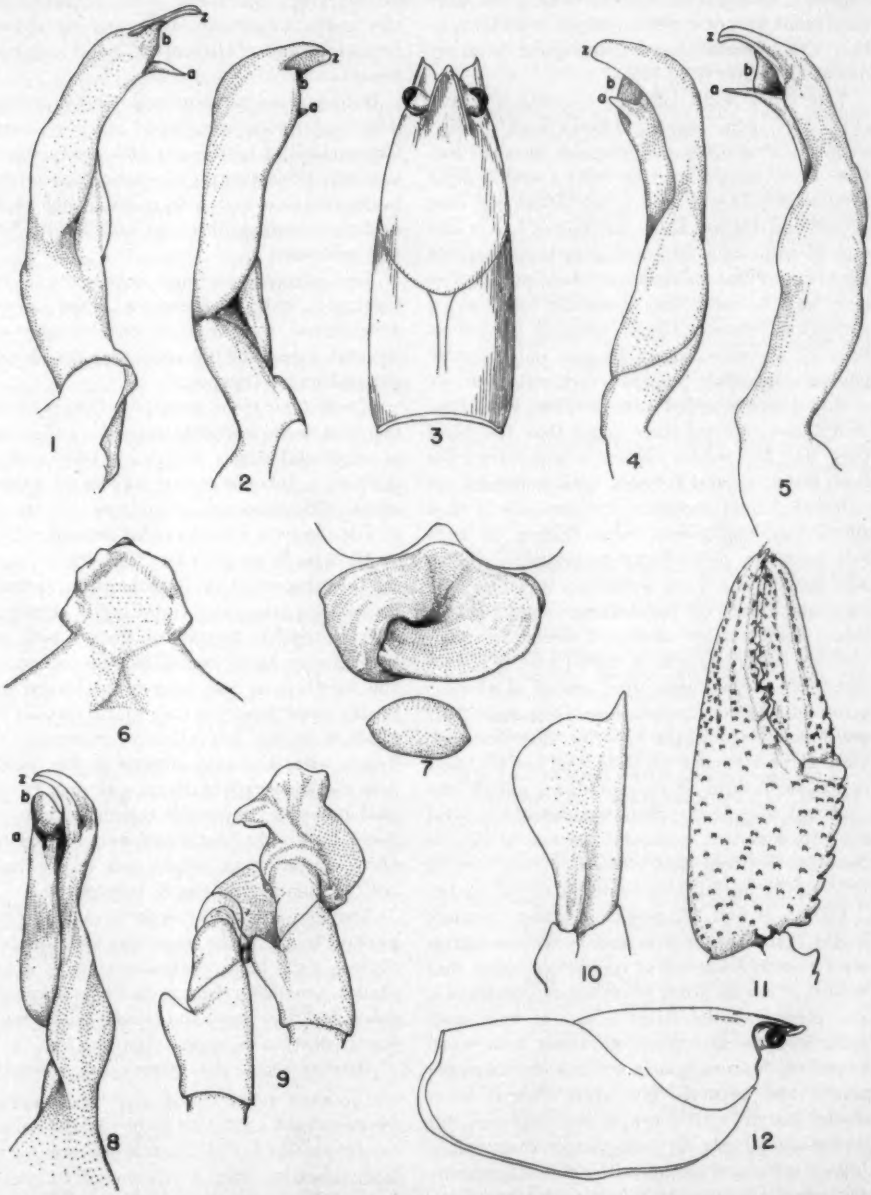
Epistome subtrapezoidal in outline with a small cephalomedian projection; cephalolateral portions inflated.

Antennules with the usual small spine on ventral surface of basal segment.

Antennae extend caudad to sixth abdominal

[1] Received March 24, 1950.

[2] The name *tenuis* refers to the slender (compressed) carapace.



FIGS. 1–12.—*Procambarus tenuis*, n. sp.: 1, Mesial view of first pleopod of holotype; 2, Mesial view of first pleopod of morphotype; 3, Dorsal view of carapace of holotype; 4, Lateral view of first pleopod of morphotype; 5, Lateral view of first pleopod of holotype; 6, Epistome of holotype; 7, Annulus ventralis of allotype; 8, Caudal view of first pleopod of holotype; 9, Basal portions of third and fourth pereiopods of holotype; 10, Antennal scale of holotype; 11, Upper view of chela of holotype; 12, Lateral view of carapace of holotype. (a—mesial process, b—cephalic process, z—central projection.) (Pubescence removed from all structures illustrated except in Fig. 11.)

segment; antennal scale broad with a well developed spine on outer distal margin; lamellar portion with rounded inner margin and broadest distad of middle (Fig. 10).

Left chela (right lacking) moderately heavy (Fig. 11); palm slightly inflated and studded with setiferous squamous tubercles on upper surface. Inner margin of palm with a row of eight prominent tubercles and a few squamous ones subtending this row above and below. Lower surface of palm with setiferous punctations except near base of immovable finger where punctations give way to setiferous squamous tubercles; a prominent corneous-tipped tubercle present at base of movable finger. Fingers only slightly gaping. Opposable margin of dactyl with six evenly spaced rounded tubercles along basal two-thirds, the proximal three larger than the distal ones, and the second distinctly larger than the first; distad of and between these tubercles are crowded minute denticles; upper surface with a submedian longitudinal ridge flanked on each side by a row of setiferous punctations, and in addition bearing a few squamous tubercles near base and scattered punctations laterad of the ridge; lower surface of dactyl similar to upper surface; lateral margin of dactyl with a row of three tubercles on basal third, distad of which is a row of setiferous punctations. Opposable margin of immovable finger with five tubercles along basal three-fifths and an additional one on lower opposable margin at base of distal fourth, the proximal four larger than the distal two, and the proximal two contiguous; a row of minute denticles between and distad of this row of tubercles; other surfaces as described for dactyl.

Carpus of first left pereiopod about 1.6 times longer than broad with a shallow oblique furrow above; surface laterad of furrow punctate; that mesiad of it with a row of setiferous punctations, and mesiad of the latter a row of four small tubercles; mesial surface of carpus with seven tubercles, four of which are evident in upper aspect and progressively larger distad; lower mesial margin with a row of five tubercles, the distomarginal one decidedly larger than others; lateral surface of carpus with setiferous punctations and a prominent tubercle on lower distal angle.

Merus of first left pereiopod with a row of 16 tubercles on upper margin and with a few additional ones flanking this row distally; lateral and mesial surfaces with setiferous punctations; lower surface with a lateral row of nine spikelike tubercles and a mesial one of 14, and an additional tubercle present between the distal members of these two rows.

Ischiopodites of third and fourth pereiopods with hooks; hooks simple and concave proximad. Coxopodites of fourth and fifth pereiopods with ventrally projecting prominences, those on fourth large, complex, and with a prominent cephalomedian extension; those on fifth small, slender, and subacute.

First pleopod reaching coxopodite of third pereiopod when abdomen is flexed; pleopods symmetrical, their cephalic surfaces convex and without a prominent hump. (See description of pleopod under Diagnosis.)

Morphotypic male, form II.—Differs from the holotype in the following respects: in the absence of suborbital angles and a few very slight differences in tubercle counts; the usual secondary sexual differences occur, however, all terminals of first pleopods except caudal element evident.

Allotypic female.—Differs from the holotype in the following respects: Branchiostegal spines well defined and acute; suborbital angles almost obsolete. Opposable margin of dactyl with seven tubercles on basal four-fifths, the second, third and fourth from base largest, the second so distinctly larger than the first that a distinct emargination occurs immediately proximad of the former with the basal tubercle in the emargination; mesial surface of dactyl with only two proximal tubercles; opposable margin of immovable finger with only four tubercles on basal three-fifths; armature of merus and carpus reduced both in number and size of tubercles.

Annulus ventralis subovate in outline with the greatest length in the transverse axis; caudal and dextral walls high; central area with a broad, shallow funnellike depression. Sinus originates in subcentral depression and crosses caudal wall distinctly dextrad of median line (see Fig. 7).

Measurements.—As follows (in millimeters):

	Holotype	*Allotype*	*Morphotype*
Carapace—height	11.5	11.4	11.2
width	10.8	9.4	9.5
length	25.6	24.0	24.7
Areola—length	9.0	8.5	9.1
width	0.5	0.5	0.6
Rostrum—length	4.5	3.9	4.2
width	4.0	3.2	3.5
Left chela—length, inner margin of palm	9.2	7.0	7.3
width of palm	8.9	8.3	8.5
length, outer margin of hand	23.2	17.0	19.3
length of dactyl	13.2	10.1	10.8

Type locality.—"Six miles east of Page and just west of Oklahoma state line, Le Flore Co., Oklahoma. In spring at base of 'mountains'," a tributary of the Little River.

Disposition of types.—The holotypic male, form I, allotypic female, and morphotypic male are in the United States National Museum (no. 90390). Of the 23 paratypes, one male, form I, one male, form II, and one female are in my personal collection at the University of Virginia (no. 6-334-1); one male, form I, five males, form II, five females, four immature males, and five immature females are in the United States National Museum (nos. 90391, 90392).

Specimens examined.—All specimens collected on June 3, 1934, by Charles E. Burt. From the type locality: 3♂♂I, 6♂♂II, 4♀♀, 2♂♂ imm., and 4♀♀ imm. From 6 miles northwest of Rich Mountain, Polk County, Ark., just east of state line: 1♂II, 3♀♀, 2♂♂ imm., 1♀ imm. Both of these localities are on tributaries of the Little River.

Variations.—Except for the differences pointed out in the above descriptions the variations among the specimens at hand are minor ones. In the females mirrored images of the annulus ventralis of that figured for the allotype occur.

Relationships.—*Procambarus tenuis* is a somewhat disjunct member of the genus *Procambarus*. Although its affinities appear to be with the members of the *Blandingii* section (see Hobbs, 1942: 93) the cephalic process of the first pleopod of the male arises from the mesial surface of the appendage, and under the cited definition this would exclude *tenuis* from this section of the genus; furthermore, it does not conform to the definitions of any of the other sections. In the practically obsolete caudal process of the first pleopod *tenuis* approaches *Paracambarus paradoxus* (Ortmann, 1906: 3)[3]; also in the latter species the cephalic process arises from the mesial side of the appendage although it is not nearly so strongly developed as that in *tenuis*. There is little reason to believe that these resemblances actually indicate close affinities, for except for these features the pleopods of the two species are distinctly different. It is more probable that *tenuis* is more closely allied to *Procambarus blandingii acutus* (Girard, 1852: 91) than to any other described species.

[3] Redescribed and carefully figured by Villalobos 1947: 233 (see pl. 3, fig. 1).

KEY TO THE CRAYFISHES OF THE GENUS PROCAMBARUS IN OKLAHOMA AND ARKANSAS

1. Areola obliterated at least in middle..... 2
   Areola broad or narrow but never obliterated. 3
2. Outer half of upper surface of palm of chela tuberculate above; movable finger without an excision on opposable margin near base; acumen distinctly set off from remainder of rostrum; suborbital angle not well defined; ischiopodites of third and fourth pereiopods in male bearing hooks; annulus ventralis without tubercles on cephalic half..*clarkii*
   Outer half of upper surface of palm of chela punctate above; movable finger with a distinct excision on opposable margin near base; acumen not distinctly set-off from remainder of rostrum; suborbital angle well defined; male with ischiopodites of third pereiopods only bearing hooks; annulus ventralis bearing tubercles on cephalic half. *gracilis*
3. Acumen distinctly set off from base of rostrum. *blandingii acutus*
   Acumen absent or not clearly set off from base of rostrum..... 4
4. Males..... 5
   Females..... 7
5. Hooks on ischiopodites of third pereiopods only. *simulans*
   Hooks on ischiopodites of third and fourth pereiopods..... 6
6. Carapace strongly compressed; central projection of first pleopod distinctly longer than other terminal elements.....*tenuis*
   Carapace not markedly compressed; central projection of first pleopod not longer than other terminal elements.....*viae-viridis*
7. Annulus ventralis with longitudinal ridges in cephalic half bearing tubercles.....*simulans*
   Annulus ventralis without longitudinal ridges bearing tubercles..... 8
8. Caudal wall of annulus ventralis high, and with a distinct median depression; sinus cuts caudal wall distinctly to right or left of median line of annulus ventralis..... *tenuis*
   Caudomedian wall of annulus ventralis low, but with a high cephalic wall bearing a median cleft; sinus cuts caudal wall near median line of annulus ventralis..... *viae-viridis*

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PROCEEDINGS OF THE ACADEMY

52D ANNUAL MEETING

The 52d Annual Meeting, concurrently with the 369th monthly meeting of the Academy, was held as a dinner meeting in the Palm Room of Hotel 2400 on January 28, 1950, at 6:30 P.M. President F. H. H. ROBERTS, JR., presided.

After the dinner, Dr. Roberts called the meeting to order and introduced the speaker, HERBERT FRIEDMANN. Dr. Friedmann gave an illustrated talk dealing with the symbolism portrayed on two of the Medici tombs by Michelangelo. He analyzed the use of an owl and a wild cat to show Michelangelo's subtle interpretation of some aspects of the Medici family on the monumental tombs he created for two of the Medici.

The minutes of the 51st Annual Meeting were approved as published in the JOURNAL **39**: 206–213. 1949.

The following reports by the various officers, standing committee chairmen, auditors, and tellers were read and accepted:

REPORT OF THE SECRETARY

During the Academy year, January 22, 1949, to January 28, 1950, there were 56 persons elected to regular membership, including 50 to resident and 6 to nonresident. Of these, 38 resident and 5 nonresident qualified for membership. Eight resident members and one nonresident member elected to membership in the preceding Academy year qualified during the present Academy year just ending. The new members were distributed among the various sciences as follows: 14 in chemistry, 6 each in mathematics and physics, 5 in plant pathology, 4 each in geology and geophysics, 2 each in archeology, bacteriology, engineering, medicine, and physiology, and 1 each in biochemistry, botany, conservation, genetics, ichthyology, mechanical engineering, and natural history.

Five resident and three nonresident members, having retired from the gainful practice of their professions, were placed on the retired list of members to enjoy all the privileges of active membership without further payment of dues. Eight resident members and three nonresident members resigned in good standing.

The deaths of the following members were reported to the Secretary:

CARL F. A. CHRISTENSEN, Copenhagen, Denmark, on November 24, 1942.

GEORGE TULLY VAUGHAN, Washington, D. C., on April 26, 1948.

EDWARD R. STITT, Washington, D. C., on November 13, 1948.

STEPHEN R. CAPPS, Washington, D. C., on January 19, 1949.

S. H. MCCRORY, Washington, D. C., on February 18, 1949.

BAILEY WILLIS, Stanford University, Calif., on February 19, 1949.

SAMUEL F. HILDEBRAND, Washington, D. C., on March 16, 1949.

GEORGE B. RICHARDSON, Washington, D. C., on March 18, 1949.

WILLIAM B. BELL, Washington, D. C., on March 30, 1949.

JOSEPH A. CUSHMAN, Sharon, Mass., on April 16, 1949.

WHITMAN CROSS, Chevy Chase, Md., on April 20, 1949.

O. F. COOK, Washington, D. C., on April 23, 1949.

PHILIP S. SMITH, Washington, D. C., on May 10, 1949.

ALFRED P. D. STOKES, Riverside, Calif., on May 17, 1949.

JOHN M. COOPER, Washington, D. C., on May 22, 1949.

SIGURD ORLA-JENSEN, Copenhagen, Denmark, on June 24, 1949.

H. M. GOODWIN, Cambridge, Mass., on June 26, 1949.

CHARLES J. BRAND, Washington, D. C., on June 29, 1949.

P. G. NUTTING, Washington, D. C., on August 8, 1949.
FRANK E. A. THONE, Washington, D. C., on August 25, 1949.
WILLIAM J. ROONEY, Washington, D. C., on August 31, 1949.
WILLIAM J. HUMPHREYS, Washington, D. C., on November 10, 1949.
JOHN TUCKER, JR., Washington, D. C., on November 20, 1949.
H. C. DICKINSON, Washington, D. C., on November 27, 1949.
ALFRED J. LOTKA, Red Bank, N. J., on December 5, 1949.
CHARLES J. CLIFFORD, Silver Spring, Md., on December 21, 1949.
CLARENCE N. FENNER, Clifton, N. J., on December 24, 1949.

CARL F. A. CHRISTENSEN, EDWARD R. STITT, and SIGURD ORLA-JENSEN were honorary members, and BAILEY WILLIS, WHITMAN CROSS, and O. F. COOK were original members.

On January 28, 1950, the status of membership was as follows:

	Regular	*Retired*	*Honorary*	*Patron*	*Total*
Resident	515	50	1	0	566
Nonresident	159	33	12	0	204
Total	674	83	13	0	770

The net changes in membership during the past year are as follows:

	Regular	*Retired*	*Honorary*	*Patron*	*Total*
Resident	+17	−5	−1	0	+11
Nonresident	+4	+3	−2	0	+5
	+21	−2	−3	0	+16

During the Academy year 1949 the Board of Managers held 10 meetings, with an average attendance of 20 persons. The following important matters were considered by the Board:

Owing to previous financial commitments, the Board of Managers endeavored to limit all operations of the Academy within the budget of the current year. Numerous suggestions were considered whereby additional income might be forthcoming. At the February 14 meeting of the Board, the Executive Committee submitted the 1949 budget, which indicated a decrease in net worth of over $4,000. The Board therefore voted to place the matter of how the Academy might recover some of this decrease in the hands of the Committee on Policy and Planning.

At the 429th meeting of the Board, on June 13, the Committee on Policy and Planning, under the chairmanship of JOHN E. GRAF, submitted a 13-page mimeographed report entitled "Means of Raising Additional Funds for the Academy." Each member of the Board received a copy to study, and this report was then discussed at the next meeting of the Board. Fourteen specific items covering all the activities of the Academy, as well as consideration of new activities, were outlined by the Committee and discussed by the Board.

Action was taken on three important items:

1. That the President meet with the Committee on Membership in order to discuss problems confronting this committee. This action resulted in the appointment by the President of five subcommitteemen within as many agencies to assist the main Committee on Membership by submitting to them the names of qualified scientists for consideration as future members of the Academy.

2. The Chairman of the Committee on Policy and Planning indicated that as a result of conferring with editors of other scientific journals, we could expect only a slight income if the JOURNAL were to accept advertising.

3. Some consideration was given to the size of the JOURNAL. The Board requested the President to appoint a committee to consider the possible saving that might result by the use of an offset printing method, as well as the formulation of an editorial policy. This committee, appointed on November 14, 1949, has not submitted a report.

Two of the regular monthly meetings of the Academy were held jointly with the Biological and Entomological Societies of Washington and were exceptionally well attended by over 400 people at each joint meeting. These were entitled *The language of bees*, by KARL VON FRISCH, of Austria, and *Ngana, African sleeping sickness of animals*, by H. H. STAGE, of the U. S. Department of Agriculture.

The Academy continued to sponsor the weekly issue of the Science Calendar in the local newspapers.

During the Academy year, eight meetings of the Academy were held, as follows:

On February 17, 1949, F. D. ROSSINI, National Bureau of Standards, delivered his retiring presidential address, on *Excursion in chemical thermodynamics*, published in the JOURNAL **39:** 249–269.

On March 17, 1949, the 1948 *Academy Awards* were presented to ROBERT J. HUEBNER, National Institutes of Health, for work in the biological sciences; to MAXWELL K. GOLDSTEIN, Office of Naval Research, for work in the engineering

sciences; and to J. A. VAN ALLEN, Johns Hopkins University Applied Physics Laboratory, for work in the physical sciences. The Academy awarded for the first time *Certificates of Merit* to seven outstanding local high-school science students: WALTER GILBERT, Sidwell Friends School; CARL WEBER WERNTZ, Calvin Coolidge High School; AGNES SCOTT PRESTON, Dunbar High School; JOHN RICHARD MCGONEGAL, St.Anselm's Priory High School; ELLEN MAE MACEWEN, Woodrow Wilson High School; CHARLES EDWARD WEIR, Dunbar High School; and WILLIAM STANTON SHIPLEY, Woodrow Wilson High School.

On April 15, 1949, KARL VON FRISCH, University of Graz, Austria, addressed a joint meeting of the Academy and the Biological and Entomological Societies of Washington on *The language of bees.*

On May 19, 1949, WILMOT H. BRADLEY, U. S. Geological Survey, addressed the Academy on *Limnology and the Eocene lakes of the Rocky Mountains.*

On October 6, 1949, H. H. STAGE, Bureau of Entomology and Plant Quarantine, addressed a joint meeting of the Academy and the Biological and Entomological Societies of Washington on *Ngana, African sleeping sickness of animals, transmitted by tsetse flies.*

On November 17, 1949, NEWBERN SMITH, National Bureau of Standards, addressed the Academy on *Technical developments in the field of color television.*

On December 15, 1949, DAVID EDWARD DAVIS, Johns Hopkins University, addressed the Academy on *Population and other ecological studies on rats in relation to city sanitation and public health.*

On January 28, 1950, HERBERT FRIEDMANN, U. S. National Museum, gave an after-dinner talk to the Academy on *The owl and the pussy cat.*

Five of the meetings were held in the Cosmos Club. The two joint meetings with the Biological and Entomological Societies of Washington, on April 15 and October 6, 1949, were held in the auditorium of the U. S. National Museum. The meeting on January 28, 1950, was held in the Hotel 2400.

FRANK M. SETZLER.

REPORT OF THE TREASURER

The Treasurer submits the following report concerning the finances of the Washington Academy of Sciences for the year ended December 31, 1949:

RECEIPTS

Dues, 1947	$18.00	
1948	151.00	
1949	3,611.75	
1950	76.00	$3,856.75
Journal, Subscriptions,		
1947	15.50	
1948	35.25	
1949	862.92	
1950	826.45	
1951	3.38	1,743.50
Reprints,		
1947	32.30	
1948	321.92	
1949	658.60	1,012.82
Sales, 1949		987.61
Interest & Dividends		975.00
Directory (33d ed.)		13.12
Monograph no. 1		265.82
Transferred from invested funds		3,000.00
Annual dinner		392.00
A.A.A.S.		400.00
Postage refund		0.19
Redeposit of Debit no. 1344A		4.50
Overpayments		3.40
Total receipts, 1949		$12,654.71
Cash balance, Jan. 1, 1949		1,569.44
Total to be accounted for		$14,224.15

DISBURSEMENTS

	1948	*1949*	*Total*
Secretary's Office	$ 214.31	$ 438.71	$ 653.02
Treasurer's Office		208.64	208.64
Subscription Manager & Custodian	31.78	28.39	60.17
Meetings Committee	13.63	317.63	331.26
Membership Committee		15.51	15.51
Journal			
Printing & mailing	1,423.28	5,016.06	6,439.34
Illustrations	127.05	264.35	391.40
Reprints	225.28	508.71	733.99
Office			
Editorial Asst.	25.00	275.00	300.00
Miscellaneous	2.08	38.32	40.40
Annual dinner		339.50	339.50
Science Fair		100.00	100.00
Monograph no. 1		2,542.02	2,542.02
Grants-in-aid		400.00	400.00
Debit Memos:			
1288A...$10.00			
1295A... 7.50			
1344A... 4.50		22.00	22.00
Refunds		11.37	11.37
	$2,062.41	$10,526.21	$12,588.62
Cash book balance as of December 31, 1949			1,635.53
Total accounted for			$14,224.15

RECONCILIATION OF BANK BALANCE

Balance as per cash book, Dec. 31, 1949			$1,635.53
Balance as per Amer. Trust Co. statement of Dec. 30, 1949		$1,480.31	
Receipts undeposited		1,123.90	
Total		$2,604.21	
Checks outstanding, as of Dec. 31, 1949			
No. 1018	$ 5.41		
1263	5.00		
1354	150.00		
1355	250.00		
1357	2.50		
1358	414.13		
1359	126.50		
1360	15.14	968.68	$1,635.53

INVESTMENTS

Washington Sanitary Improvement Co.			
Certificate no. A 182—818 shares at $10			$8,180.00
Potomac Electric Power Co.			
Certificate no. TAO 1977—40 shares 3.6% pref. at $50			2,000.00
City of New York—3% (Transit Unification) Due—June 1, 1980			
Certificate No.			
D 20186	$500.00		
C 71038	100.00		
C 71039	100.00		
C 71040	100.00		800.00
First Federal Saving & Loan Ass'n.			
Investment account book			2,000.00
Northwestern Federal Savings & Loan Ass'n.			
Certificate No. 1380	$4,500.00		
1441	500.00		$5,000.00
United States Government			
Series G Bonds:			
No. M 332990 G	1,000.00		
M 332991 G	1,000.00		
M 332992 G	1,000.00		
M 332993 G	1,000.00		
M 1808741 G	1,000.00		
M 2226088 G	1,000.00		
M 2982748 G	1,000.00		
M 4126041 G	1,000.00		
M 5141346 G	1,000.00		
M 5141347 G	1,000.00		$10,000.00
American Security and Trust Co.			
Savings account			46.87
Total			$28,026.87
Cash balance Dec. 31, 1949			1,635.53
Total			$29,662.40

Total as of Dec. 31, 1948	$32,596.31
Total as of Dec. 31, 1949	29,662.40
Decrease	2,933.91

At the close of business on December 31, 1949, there were 33 members of the Academy who were in arrears, 20 for 1 year, 5 for 2 years, 7 for 3 years, and 1 for 4 years.

HOWARD S. RAPPLEYE.

REPORT OF AUDITING COMMITTEE

The accounts of the Treasurer of the Washington Academy of Sciences for the year 1949 were examined by your auditing committee on January 18, 1950.

The accompanying copy of the Treasurer's report was checked and found to be in complete agreement with the records and with the cash balance of the Academy at the American Security & Trust Co. The bank deposits were found to check with the record of the receipts from all sources. All disbursements had been duly authorized and were found to be supported by vouchers and cancelled checks. The securities of the Academy were inspected and found to be in agreement with the list given in the Treasurer's report and to have all coupons attached that are not yet due.

Your auditing committee takes pleasure in commending Treasurer HOWARD S. RAPPLEYE for the orderly way in which he has kept the accounts of the Academy.

N. F. BRAATEN.
C. V. MORTON.
LLOYD G. HENBEST, *Chairman.*

REPORT OF THE BOARD OF EDITORS

Volume 39 of the JOURNAL, for the year 1948, contained 429 printed pages, 4 more than for the previous year but 19 less than for 1947. Because of a need to reduce the expenditures of the Academy, and because of uncertainty concerning the cost of publication with a new printer, the number of pages was held down, with the result that we came well within the budget allotment. Considerably fewer papers were published in 1949 than in 1948, and the papers in the biological sciences were proportionately more numerous than last year, possibly the result of there being two biologists on the editorial board. There were 43 papers in biology, 4 papers in the physical sciences, two of which were presidential addresses,

and 10 papers in the social sciences. The proportions by pages were: Biological sciences, 58 per cent, of which 86 per cent were taxonomic; physical sciences, 14 per cent; social sciences, 16 per cent; Proceedings of the Academy and obituaries, 12 per cent. There were 19 obituaries in 1949 as against 3 for 1948.

The disbursements for the JOURNAL during 1949 were:

Printing, engraving, and mailing	$5,834.00
Reprints	834.53
Office—Editorial Assistant	300.00
Office—Miscellaneous	25.25
Total	$6,993.78
Charges to authors	979.94
Net cost of JOURNAL to Academy	$6,013.84

In 1948 the net cost to the Academy was $5,602.19. A 20-percent increase in cost was expected under the new printing rates, but this did not materialize.

This year the JOURNAL was printed by the Waverly Press, Inc., of Baltimore. The work of this press has proved very satisfactory on the whole. It is regretted that no issues have appeared on the fifteenth of the month and that two of them were more than three weeks late, but it is hoped that this condition can be improved in the future.

The Board of Editors wishes to acknowledge the cooperation of the Board of Managers and the officers of the Academy. Special thanks are due, as usual, to Mr. PAUL H. OEHSER who so ably handles the preparation of manuscript for the printer, the sending of proof to the authors, and the final correction of the galleys and the make-up of the issues. The Editors also wish to thank Mr. FRANCIS C. HARWOOD, of the Waverly Press, for his helpful suggestions in connection with the printing of the JOURNAL.

ALAN STONE.
FRANK C. KRACEK.
FREDERICK J. HERMANN.

REPORT OF CUSTODIAN AND SUBSCRIPTION MANAGER OF PUBLICATIONS

Subscriptions

Nonmember subscriptions in the United States and possessions	143
Nonmember subscriptions in foreign countries	80
Total	223

This is a gain of 20 subscriptions over last year's number, and represents the highest total in the 10 years since this office was created. It is hoped that this growth will continue in the coming year.

Inventory of stock as of December 31, 1949

Reserve sets of the Journal

Complete sets, vols 1–39	4
Volumes 11–39	6
" 16–39	9
" 21–39	5
Total sets more or less complete	24

Back numbers of the Journal

Numbers in complete sets (4)	2,604
Numbers held in reserve for complete sets	8,023
Numbers held for sale separately	—*
Total back numbers on hand	—*

Proceedings

Complete sets, volumes 1–13 (1899–1911) 48 sets
(The copies of the separate articles in the Proceedings that are on hand have not been counted.)

Monograph no. 1

Original issue	1,010
Copies sold or otherwise distributed	94
Number of copies on hand	916

* A count of these separate numbers has not been made recently, pending a rearrangement of the back stock and a subsequent recount and audit.

Sales

During the year two complete sets of the JOURNAL were sold, one to the Communicable Disease Center of the U. S. Public Health Service in Atlanta, Ga., and the other to the Swiss Federal Institute of Technology in Zurich, Switzerland. One set of the Proceedings was sold to the latter institution as well. In addition, 273 numbers of the JOURNAL were sold, either separately or as volumes. This is a considerable increase in sales over last year, when no sets were sold, and only 195 separate numbers were sold.

Eight numbers of the Proceedings and three copies of the 1947–48 Directory were sold.

On January 22, the first number of the Monograph Series of the Academy was published, a work by Dr. Herbert Friedmann of the U. S. National Museum, entitled *The parasitic cuckoos of Africa*. The issue of this book numbered 1,010 copies. Of these, 10 were given to the author as

free copies, and 15 were sent to scientific journals for review. During the year 17 copies were sold to the author (at a 20-percent discount), 30 to dealers (at a 10-percent discount), and 20 were sold directly at the full price of $4.50. The number of copies sold was therefore 67. Attempts will be made this coming year to circularize prospective buyers and interested parties to increase the sales of this book.

During the year the Academy received from one of its members, Dr. N. ERNEST DORSEY, an almost complete set of the JOURNAL. This generous gift enabled us to make up a reserve set of the JOURNAL to replace one of the two sold. To Dr. Dorsey, and to the other members who from time to time have donated copies to this office, the Academy is deeply indebted. We are still anxious to obtain early volumes of the JOURNAL in order to make up more complete sets, for which we feel there will be a continuing demand.

The income from all sales during the past year was $987.61. This is the highest that this figure has ever reached.

Expenditures

Supplies	$ 8.26
Postage expended in connection with JOURNAL	11.62
Postage expended in connection with Monograph	10.31
Telephone call	.50
Storage charges for stock held at Baltimore	11.—
Total	$41.69
Refund, sales—1949	.20
Net expenses	$41.49

Storage

The charge for storage listed above will be a more or less constant annual expenditure, as arrangements have been made to remove at the end of each year the remaining stock of numbers of the last volume from Baltimore to the storage room kindly furnished by the officials of the Smithsonian Institution to the Academy for this purpose. In the early part of this year the stock formerly held in storage by the George Banta Publishing Co., in Menasha, Wis., was shipped here. As mentioned earlier in this report, the rearrangement of our storage facilities is in process.

HARALD A. REHDER.

REPORT OF THE ARCHIVIST

The archives have been kept in my office in the Soils Building at the Plant Industry Station in Beltsville. A portion of them are in a 4-drawer steel vertical file and in a 3-drawer wooden vertical file section, which belong to the Academy. In addition, a steel safe and two bookcases, which are the property of the laboratory, are occupied.

During the year the archives have not been disturbed except in the few cases when members have requested certain information, which I was happy to give. It seems to me that the archives should be consulted oftener than they are. Perhaps one reason for the lack of interest in them is the fact that the books containing the minutes of the meetings of the Board of Managers are kept in the Secretary's Office. That is more convenient since he has to refer to them often.

NATHAN R. SMITH.

The General Chairman of the Committee on Awards for Scientific Achievement, W. A. DAYTON, announced the recipients of the Academy Awards for 1949 as follows:

Biological Sciences: Dr. EDWARD G. HAMPP, National Institutes of Health, in recognition of his original and fundamental contributions to the knowledge of diseases of the oral cavity, particularly because of his being the first to isolate in pure culture *Borrelia vincentii*, thus making possible new approaches to the study of spirochetes.

Engineering Sciences: Dr. RICHARD K. COOK, National Bureau of Standards, in recognition of his distinguished service in acoustics and his method of absolute calibration of microphones.

Physical Sciences: Dr. JOHN A. HIPPLE, National Bureau of Standards, in recognition of his distinguished service in advances in mass spectrometry and in the precise measurement of atomic constants.

REPORT OF THE COMMITTEE ON MEMBERSHIP

During the Academy year the Committee on Membership has held 8 meetings and has processed 59 nominations for membership. Of these 59 nominations, 23 represent the physical sciences, 17 the engineering sciences, and 23 the biological. The scientific background and the achievements of each nominee were abstracted and presented to the Board of Managers at its regular meetings.

The Chairman of the Committee wishes to place on record his thanks and appreciation to all members of the Committee for their kind cooperation in carrying on the work, and to the President and members of the Board for many helpful suggestions.

H. E. McComb, *Chairman.*

REPORT OF COMMITTEE ON ENCOURAGEMENT OF SCIENCE TALENT

The Committee arranged for the participation of the Academy, as sponsor, in the Eighth Science Talent Search of the Westinghouse Educational Foundation. This first talent search in the District of Columbia resulted in the selection by the Committee of seven local participants in the national search to receive an award of a certificate of merit from the Academy. The awards were presented by the Academy at its Honors Meeting in March 1949. The Academy is sponsoring the local talent search again this year, and the Committee will recommend its selections to the Board of Managers in February.

The Academy, through the Committee, again sponsored the Annual Science Fair for local high-school students, held April 1–9, 1949, in cooperation with the science departments of the Public Schools of the District of Columbia. Over 600 exhibits were judged by members of the Academy to receive locally donated awards. The Fourth Annual Science Fair is now being arranged.

The problems of formation of a Junior Academy of Sciences are being studied by the Committee, and recommendations will be made to the Board of Managers in the near future.

The expense of the Committee consisted of $100, representing the Academy's contribution to support of the Third Annual Science Fair.

Martin A. Mason, *Chairman.*

REPORT OF COMMITTEE ON THE INDEX TO THE JOURNAL

In pursuance of the Committee's report of last year and in accordance with the contract, which was signed January 5, 1949, Miss Mary A. Bradley has been at work preparing an author-subject index for the first 40 volumes of the Journal. The work is going forward independently, with Miss Bradley making periodic consultations with Mr. Oehser; as the index of each volume is completed, the copy in the form of index cards is brought to Mr. Oehser's office in the Smithsonian Institution Building. By the end of the year 1949, Miss Bradley had delivered the index copy for volumes 1 through 15, thereby fulfilling the specifications and the time schedule of work as attached to the contract.

Miss Bradley's bill in the amount of $500, which was due on the completion of the above stint, has been approved for payment by the Chairman of the Committee and has been forwarded to the Treasurer for payment.

Since there were no further matters of general policy for the Committee to determine, no meetings were called by the chairman.

Your Committee wishes to advise, however, that the work of preparing the index will be completed by the end of 1950. It is not too early, therefore, to make definite plans and devise some means for the early publication of the index while Miss Bradley is still available, under terms of the contract, to see the index through the press.

W. N. Fenton, *Chairman.*

After acceptance of the report of the Committee of Tellers by the members, the President declared the following individuals elected to the given offices:

Nathan R. Smith, *President-Elect*
Frank M. Setzler, *Secretary*
Howard S. Rappleye, *Treasurer*
Howard P. Barss and A. T. McPherson, *Board of Managers to January 1953.*

The following members of the Academy were nominated by the Affiliated Societies for Vice-Presidents of the Academy:

Philosophical Society of Washington—Frank C. Kracek
Anthropological Society of Washington—Waldo R. Wedel
Biological Society of Washington—
Chemical Society of Washington—James I. Hoffman
Entomological Society of Washington—C. F. W. Muesebeck
National Geographic Society—Alexander Wetmore
Geological Society of Washington—James Steele Williams
Medical Society of the District of Columbia—Frederick O. Coe
Columbia Historical Society — Gilbert Grosvenor
Botanical Society of Washingtom—Freeman A. Weiss
Washington Section, Society of American Foresters—William A. Dayton
Washington Society of Engineers—Clifford A. Betts
Washington Section, American Institute of Electrical Engineers — F. M. Defandorf

Washington Section, American Society of Mechanical Engineers—RICHARD S. DILL
Helminthological Society of Washington—EMMETT W. PRICE
Washington Branch, Society of American Bacteriologists—MARGARET PITTMAN
Washington Post, Society of American Military Engineers—HENRY W. HEMPLE
Washington Section, Institute of Radio Engineers—HERBERT G. DORSEY
District of Columbia Section, American Society of Civil Engineers—OWEN B. FRENCH

The members instructed the Secretary to cast a unanimous ballot for these nominees.

The retiring President, F. H. H. ROBERTS, JR., expressed thanks to the members, officers, and Board of Managers for their cooperation. He then introduced the new President, FRANCIS B. SILSBEE, who had served as President-Elect during 1949. Dr. Silsbee after a few interesting remarks adjourned the meeting at 9:45 P.M.

FRANK M. SETZLER, *Secretary.*

437TH MEETING OF BOARD OF MANAGERS

The 437th meeting of the Board of Managers, held in the Cosmos Club on April 17, 1950, was called to order by the President, F. B. SILSBEE, at 8:07 p.m. Also present were: N. R. SMITH, H. S. RAPPLEYE, J. A. STEVENSON, F. C. KRACEK, F. M. DEFANDORF, H. P. BARSS, A. T. MCPHERSON, J. I. HOFFMAN, J. S. WILLIAMS, F. A. WEISS, W. A. DAYTON, C. A. BETTS, R. S. DILL, MARGARET PITTMAN, O. B. FRENCH, F. M. SETZLER, and, by invitation, R. G. BATES.

The Chairman of the Committee on Meetings, F. M. DEFANDORF, reported that the May 18 meeting of the Academy would be a joint meeting with the Anthropological Society of Washington, at which time F. M. SETZLER would deliver his lecture on *Aboriginal Australia.*

The Chairman of the Committee on Membership, R. G. BATES, submitted the names of 12 nominees for resident and 3 for nonresident membership. Seventeen individuals previously nominated were elected to resident membership.

The Committee on the Encouragement of Science Talent reported that the annual Science Fair sponsored by the Academy would be held on May 15–19, 1950.

The Archivist, J. A. STEVENSON, indicated that he and N. R. SMITH are continuing the work of organizing the Academy's archival records.

The meeting was adjourned at 8:45 p.m.

F. M. SETZLER, *Secretary.*

Obituaries

HOBART CUTLER DICKINSON was retired in 1945 at the legal age limit of 70, after having served 40 years as a physicist at the National Bureau of Standards. This emeritus rating gave him the opportunity to put his youthful energy into a new research of his own choosing. This he enjoyed for four years until cancer ended his career on November 27, 1949, only a few weeks after he had started the final plans for the sequel to his earlier book in the field of economics.

Dickinson was born in Bangor, Maine, on October 11, 1875. Although he descended from a line of Congregational ministers, he said from his early boyhood that he wanted to be an inventor. In 1880 his parents left New England to live in the Central States; but in 1890 his father returned to Massachusetts and the boy, then 15, made the trip from Nebraska in a freight car with the family belongings, including two horses that had to be fed and watered. During the trip the car was in a wreck that demolished the animal stalls, and the young lad had to use his inventive ability to get at the tools and repair the damage.

In 1900 he was graduated from Williams College and continued there under Dr. C. W. Waidner to get his M.A. in 1902. He spent the next year at Clark University under Prof. A. G. Webster and returned there in 1910 to get his Ph.D. In 1903 he followed Dr. Waidner to the National Bureau of Standards and in the next ten years was the coauthor of several fundamental papers on thermometry. His doctor's thesis was on combustion calorimetry, and his design of calorimeter, with some refinements, is still yielding the most accurate results attainable today. From 1912 to 1917 he was in charge of work at the Bureau of Standards on the constants of refrigeration in a program sponsored by the American Society of Refrigeration Engineers. He

contributed to this program as coauthor of papers on the calorimetry of ice and on the thermal conductivity of insulating materials.

At the onset of World War I, the bureau director, Dr. Stratton, asked him to assist in the development of aircraft engines, and he participated in the design of the Liberty Engine, which was one of the engineering triumphs of that time. Dickinson organized the aeronautical power-plant section of the heat division in 1917 and was largely responsible for the design and operation of the first altitude chamber in which full-sized aircraft engines were tested under conditions simulating altitudes up to 35,000 feet. After the war the activities of the section were expanded to embrace automobiles and their behavior on the road, including the performance of headlights and brakes. One of his many articles in this period was entitled "What is Safe Speed?" wherein he established the "clear course rule" which has become accepted in several States as the basic element of traffic regulations. He was instrumental in getting the automotive and petroleum industries to cooperate in research on the mutual adaptation of engines and fuels. From 1921 to 1923 he organized and directed the research department of the Society of Automotive Engineers at the headquarters in New York City, and in 1933 he was president of that society.

In 1923, after the death of Dr. Waidner, he returned to the Bureau of Standards as chief of the Division of Heat and Power and continued in that capacity until his retirement. During this period he devoted special attention to the power part of the division and organized it into separate sections on automotive research, aircraft engines, and lubrication.

About 1930 he began a study of the factors involved in economic depressions. He applied the physicist's mathematical analysis to economics and constructed a mechanical analogy to illustrate it. This study led to the publication, in 1937, of his book *The mechanics of prosperity*.

Dickinson was an ardent hiker and preferred to spend his vacations in the mountains. In his later years he served the Potomac Appalachian Trail Club in its program of shelter building. On his first trip to the Canadian Rockies with the Alpine Club of Canada he took only a small spare blanket and water-repellent sheet when he should have taken all his own bedding. Confronted with bleak prospects he remembered his measurements on insulating materials and with his usual resourcefulness gathered balsam boughs in considerable quantity to put between his blanket and his sheet. The result astonished him, and he soon learned that a relatively small thickness of balsam furnished sufficient insulation to keep him pleasantly warm even on freezing nights.

He was married in 1903 to Elizabeth S. Wells, who died in 1921. He was married again in Scarborough, England, to Mabel V. Kitson in 1923. Their daughter Anne and her husband, Hugh N. Ross, have carried on the scientific tradition of the family. Both graduated in physics at the University of Maryland. Ross is now continuing the research on the thermal conductivity of high-temperature insulators that Dickinson chose after his retirement.

H. F. STIMSON.

GEORGE SAMUEL RICE died at the Washington Sanitarium in Takoma Park, Md., on Janu- 4, 1950. He was a pioneer in applying scientific knowledge to increase safety and improve efficiency in mining. Born in Claremont, N. H., on September 6, 1886, he received an E.M. degree from Columbia University in 1887, and for two decades served the mining industry as a geologist, mining engineer, or superintendent of production, involving coal, lead, zinc, phosphate, and potash.

In 1908 he was invited to join the Technological Branch of the U. S. Geological Survey to investigate the causes of coal-mine explosions and seek remedies to eliminate them. With the establishment of the Bureau of Mines in 1910, the work was transferred to that agency, and Dr. Rice became the chief mining engineer, with headquarters first at Pittsburgh and later in Washington. He served in that capacity until his retirement in 1937.

Dr. Rice was a prime mover in the bureau's efforts to prevent coal-mine explosions. Under his direction, a steel gallery was constructed at Pittsburgh, Pa., and the Experimental Mine, at Bruceton, Pa., was developed to test the explosibility of coal dust. Many miners owe their lives to his success in reducing the number of explosions in coal mines and in inaugurating other safety practices.

As early as 1891, Dr. Rice observed that coal-dust explosions in a coal mine in Iowa died out in areas where the dust was high in ash. His observations were presented before the Illinois Coal Mining Institute and published in the 1893 Transactions.

In 1911, he was made a member of the Canadian Government's Commission to determine landslide hazards from mining operations, an investigation inspired by the Turtle Mountain rock slide. A year later he organized the first international conference of mine-safety research investigators, which met in Pittsburgh. He was a pioneer in the introduction in the United States of permissible mine explosives, mine rescue apparatus, and the use of rock-dust in coal mines to prevent coal-dust explosions.

During World War I, Dr. Rice suggested that the Bureau of Mines' engineers and chemists, experienced in dealing with explosives and poisonous gases in mines, would be of great assistance in developing masks to protect our troops against war gases. The project was instituted by the bureau and later transferred to the War Department. During the Armistice, he reported on war damage to French and Belgian mining and metallurgical plants.

From 1919 to 1922, when the Holland Vehicular Tunnel between New York and New Jersey was being constructed, he participated in ventilation tests and studies.

He visited Europe in 1923 as a representative to the International Mining Congress in London and, while abroad, studied progress in the use of rock-dust to prevent coal-dust explosions, methods of mining oil shale in Scotland and oil sands in France and Germany, potash mining in France and Germany, and hydraulic stowing to prevent or minimize surface subsidence.

Dr. Rice arranged for cooperation in mine-safety research between the bureau and the British Mines Department, serving as liaison officer until his retirement. During 1928 he investigated disastrous outbursts of gas in certain coal mines in Belgium, southern France, and lower Silesia. In 1935 he was the United States representative to the Seventh International Congress on Mining and Applied Geology in Paris.

He received international recognition for his outstanding services. In 1923, the British Institution of Mining Engineers, of which he was made an honorary member, awarded him a medal for "eminence in all matters relating to the safe working of coal mines— with special reference to the practical application of scientific knowledge." In 1931 he was awarded a medal by his alma mater, Columbia University. In 1936 he was awarded a degree of Doctor of Science by Lafayette College. In 1937 he was made an honorary member of the Canadian Mining and Metallurgical Institute. He was also an honorary member of La Societe de l'Industrie Minerale, France. In 1946 he was awarded a medal by the Joseph A. Holmes Safety Association.

Among the other organizations with which Dr. Rice was affiliated were the Geological Society of Washington (since 1923), the American Institute of Mining and Metallurgical Engineers, the Dust Explosion Hazard and Mine Correlating Committees of the American Standards Association, the Mining Society of America, the American Association for the Advancement of Science, the Coal Mining Institute of America, the Washington Society of Engineers, the Washington Academy of Sciences, and the Cosmos Club.

At various times he assisted in the revision of mine-safety regulations in various states, and he nitiated a conference of representatives from public-land states for the purpose of drafting regulations to apply to mining operations on public lands under lease from the Government.

His passing is deeply regretted by his former associates and friends and by those who knew him through his publications. His work and publications are of enduring value to the mining industry. Surviving are his widow, Mrs. Sara Marie Rice; a daughter, Mrs. Katherine Mollison, of Wellesley Hills, Mass.; a son, J. Brewster Rice, of Short Hills, N. J.; and a brother and four grandchildren.

H. I. SMITH.*

CLARENCE ARTHUR REED, a member of the Washington Academy of Sciences, passed away on January 14, 1950—a few days before his 70th birthday—in a Lakeland, Fla., hospital after a brief illness. He had suffered from a heart condition for several years.

Mr. Reed was born on January 23, 1880, in Howell, the county seat of Livingston County, Mich. He graduated from Michigan State College in 1905 with the degree of B.S. and received the degree of master of horticulture from the same institution in 1913. He married Miss Katherine McNaughton in 1910, who, with a daughter, Mrs. Harris Richardson, of Washington, survives him. His first employment was with a Chicago landscaping firm. In 1906 and 1907 he was assistant horticulturist

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at the Maryland and West Virginia Agricultural Experiment Stations, respectively. He was the first man in the U. S. Department of Agriculture to be assigned exclusively to nut investigations and, from 1907 to his retirement in 1947, was associate pomologist and specialist in nut investigations in the Bureau of Plant Industry (now Plant Industry, Soils, and Agricultural Engineering) of that Department. Mr. Reed's special interests were in the pecan, filberts, walnuts, and chestnuts. Two of his filbert novelties (nos. 1667 and 2336) are now under test. He played a leading part in establishing the experimental stations for nut production, breeding, and disease-prevention at Shreveport, La., and Albany, Ga. His work also led to Congressional appropriations establishing pecan experiment stations in several parts of the country. He spent four months in China in 1922 investigating the local Persian walnut situation, removing fears of American growers of Chinese competition in that field.

At the time of his death Mr. Reed was engaged in preparing a book on nut culture to be published by Chronica Botanica. It is hoped that some competent person can take up his large manuscript and carry it to completion. Mr. Reed was a prolific writer, especially in the nut journals, and the 50-odd titles listed in the Department of Agriculture Library card catalogues perhaps represent only a third of his published papers. Among his best-known works are the Department of Agriculture bulletins on the pecan and on nut-tree propagation. He was the author of the nut names lists in *Standardized plant names* and prepared articles on nut culture for the Encyclopedia Brittanica.

Mr. Reed was a member of the Botanical Society of Washington, was a past president of the Northern Nut Growers Association, was elected in 1929 as the first (and only) honorary member of the National Pecan Growers Association, and, from 1919 until his resignation in 1938 was a member of the Cosmos Club. He was the recipient of the Wilder Medal of the American Pomological Society for his work with filberts.

Mr. Reed resided at 7309 Piney Branch Road, Takoma Park, and was active in religious, civic, and philanthropic enterprises. He was a counselor for the Boy Scouts of America, an elder in the Takoma Park Presbyterian Church, and has been Sunday School superintendent and president of its Brotherhood Club. It is well known that the black walnut stands of the country were depleted during World War I, due particularly to heavy utilization for gunstocks and airplane propellers, and Mr. Reed took the initiative in having boy scouts collect, distribute, and plant black walnuts. He was much interested in the Takoma Park Improvement Association and was instrumental in having a scion of the famous Washington Elm of Cambridge, Mass., planted in the local park. The writer recalls the deep hurt Mr. Reed felt at the wholly unjustified and inaccurate questioning of the origin of this scion by a distinguished American scientist. Mr. Reed's disposition and nature were marked by unaffected kindness, simplicity, integrity, loyalty, and sympathy; his friends were legion.

WILLIAM A. DAYTON.